Metals Review

THE NEWS DIGEST MAGAZINE

Volume XXV - No. 3 March, 1952

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Elements of Hardenability

By M. A. Grossmann

United States Steel Company

The author of this important book brings practical experience and sound judgment to bear upon a modern concept of the quantitative aspects of hardenability. The four sections are well illustrated with many graphs and charts to insure thoroughness of treatment as well as clarity of presentation.

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Residual Stress Measurements

Four leading authorities are represented in this book on Residual Stresses in Metals. First presented as educational lectures during the 33rd National Metal Congress in Detroit, the four chapters are brought together here in a volume of fundamental importance to every Metallurgical Engineer concerned with stresses that are dormant in metals and metal parts prior to actual structural or operating use.

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Metal Interfaces

This book contains the formal papers given at the annual Seminar presented under the auspices of the Society and arranged through the ASM Seminar Committee composed of the following members: J. H. Holloman, Chairman, J. B. Austin, R. M. Brick, Morris Cohen, M. Gensamer, L. R. Jackson, L. K. Jetter, Don McCutcheon, Oskar Marske, Earl R. Parker and C. Zener. The two-day meeting which preceded the opening of the 33rd annual National Metal Congress and Exposition in Detroit was attended by over 500 leading metallurgists and physicists of this country and from other nations all over the free world.

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Metals Review

THE NEWS DIGEST MAGAZINE | **VOLUME XXV, No. 3** | **MARCH, 1952**

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IMPORTANT LECTURES

DEPARTMENTS

ASM REVIEW OF METAL LITERATURE

NATIONAL METAL CONGRESS & EXPOSITION

Convention Halls, Philadelphia • October 20-24, 1952

Competition for Students at the 1952 ASM Metallographic Exhibit

THE DETAILS .... ▸ Undergraduates can now compete on an equal basis at the metallographic exhibit held each year at the National Metal Congress and Exposition without limitations as to subject matter or techniques. Separate panels will be erected for adequate display of their best work. It is not necessary that the Entry show anything novel in microstructure or techniques; Excellence of student performance in the school's laboratory will be judged by the same jury which appraises the work of professionals. Prizes will be awarded as follows:

First Prize—Bronze Medal and $25 cash.
Honorable Mentions—Ribbon and $10 cash.

THE RULES .... ▸ Entrants are restricted to undergraduate students of academic institutions. ¶No more than two entries will be accepted from a single student. ¶Work must be done during the current academic year. ¶ Entries must be mounted separately on stiff cardboard. ¶ Each mount must contain pertinent information regarding subject, etchant, magnification, and special techniques (if any). ¶ Maximum size of mount, 14 x 18 in. ¶ Entrant must sign mount and give name of institution, course being studied, and year of graduation. ¶ Mount must be signed by department head, as evidence that the above conditions are met.

Send Entries (BEFORE SEPTEMBER 1, 1952) to

METALLOGRAPHIC EXHIBIT—***Student Division***

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Forecasts Smaller Steel Plants Close to Consumer as Industry Trend

Reported by Eugene M. Smith
Youngstown Sheet and Tube Co.

"Trends in the Steel Industry", as seen by Harry W. McQuaid, nationally recognized consulting metallurgist, provided a fitting subject for Past Chairmen's Night, observed by the Mahoning Valley Chapter A.S.M. on Jan. 8.

Harold Johnson of National Malleable and Steel Castings Co. was awarded a certificate in recognition of his outstanding leadership in A.S.M. affairs during the year 1951. Other past chairmen taking part in the celebration were E. E. McGinley, assistant division superintendent for U. S. Steel Co., Ohio Works; T. E. Eagan, research metallurgist, Cooper-Bessemer Co.; M. A. Hughes, chief process metallurgist, U. S. Steel Co., Ohio Works; J. A. Ritz, superintendent, Metals Carbide Co.; and J. E. Phillips, chief metallurgist, Cold Metal Products Co.

Mr. McQuaid opened his talk with some food for thought on the economics of the steel industry.

Costs of labor and transportation are increasing at a more rapid rate than raw material costs, he pointed out. In addition, with natural gas and electricity constantly becoming more economical sources of industrial power, there is an accelerating trend toward establishing small plants in locations nearer to the consumer than to coal deposits. The persistent increase in tax rates is conducive to the promotion of smaller industrial establishments rather than large integrated steel mills. If these handicaps persist, impetus will be given not only to decentralization of plants but also to greater specialization of production by smaller capitalized firms in spite of any resulting adverse effect on production cost.

The electric furnace compares favorably on a cost basis with the openhearth, especially for the smaller semi-integrated plant, Mr. McQuaid continued. All types of low-carbon as well as highly alloyed steels can be made in the electric furnace. Top-charging furnaces have made the more conventional electric furnaces economically obsolete. Furthermore, slag high in iron oxide (up to 40%) can be easily handled in the electric furnace. Surface quality of high-sulphur steels is superior to that of openhearth ingots.

Since production rates are faster and a smaller ingot is produced, a semicontinuous process is possible in the electric furnace. The necessity for rolling ingots into blooms can frequently be circumvented, and bars and rods can be rolled directly from the billet-type ingot. Thus, conditioning costs are eliminated and product yield is increased. Chance of off-heats, especially with respect to carbon and manganese, is less in electric furnace steelmaking.

Mr. McQuaid then turned his attention to the blast furnace. It is a sound observation that basic freight rates and cost of labor constantly increase. Furthermore, the blast furnace is recognized as primarily a relatively low-efficiency gas producer. Since the gas passes the charge only once, use of recirculating hydrogen for low-temperature reduction of iron ore has fascinating possibilities. Natural gas is an excellent source of hydrogen, and, with the present developments in cracking equipment, it is not unreasonable to anticipate that reduction of iron ore might be accomplished at the iron mine. Thus, transportation of 50% gangue could be avoided.

The three most important problems in keeping the steel industry abreast of the industrial revolution are the costs of obsolescence, inadequacy, and physical decay, the speaker concluded.

Obsolescence can occur overnight. Progress in design and invention is increasing at an accelerating rate. Inadequacy—the inability of equipment to keep up with increasing demand and changes in processing—is evident in almost all industrial establishments. Physical decay leading to high maintenance expenses is an ever-present problem. Constant effort must be expended to postpone the eventual.

A Photograph Taken by Chapter Chairman Henry A. Holberson at a Recent Mahoning Valley Meeting Shows, From Left: Mr. Holberson Himself; Robert P. Hill, Vice-Chairman; Harry W. McQuaid, the Principal Speaker; and Edward E. McGinley, One of the Honored Past Chairmen

Associate Editor Named

A new name has been added to the *Metals Review* masthead with the appointment of Betty A. Bryan as associate editor. Miss Bryan is a graduate of Simmons College, Boston, where she took a special course in publishing and editorial techniques. She has been with the American Society for Metals for the past year as an editorial assistant on *Metal Progress* and *Metals Review*.

Local Industry Supports Rochester Lecture Series

Rochester Chapter A.S.M. has recently completed a 12-lecture course on "Behavior of Engineering Materials". The subjects covered were essentially as follows:

Basic principes of strength of materials.

Common laboratory tests (tension, compression, shear, bending, hardness, impact, fatigue, creep).

Recent trends and developments in testing.

Interpretation and significance of laboratory tests (combined stresses, experimental stress analysis, SR-4 strain gages, "Stresscoat", photo-elastic analysis).

The lectures were all presented by Prof. Richard F. Eisenberg of University of Rochester, and were supplemented by films and slides.

No charge for the course was made to A.S.M. members, but nonmembers were charged a fee of $5. The course was well supported by local industry, as evidenced by the fact that all fees for nonmembers were paid by their respective companies.

Welded Chain Was Early Example of Quantity Production

Reported by L. R. Franz
Boeing Airplane Co.

In 1778 Peter Townsend was commissioned to make a chain whose weight, including fastenings, was about 180 tons. The chain was to be placed across the Hudson from Constitution Island to West Point, N. Y., with the intended purpose of stopping the British fleet from sailing up the river. The chain was made on 17 forges operated continuously by 60 men. It might well be considered the first example of quantity production in the United States. Each link of this chain was welded; the links were approximately 2 to 3 ft. long and weighed about 140 lb.

With this historical introduction, Gilbert S. Schaller, professor of mechanical engineering at the University of Washington, presented a talk on "Welding—Recent Developments and Current Status" before the January meeting of the Puget Sound Chapter A.S.M.

Gas welding, he said, had its beginning in France about the turn of the century. Difficulty was encountered in early attempts to compress acetylene gas—a problem solved by Claude and Hess. Their discovery opened the way for oxy-acetylene welding.

Electric arc welding was first used in the United States during the latter part of World War I. Both alternating and direct current are now used, although direct current was at first easier to use because of the directional current probability. With the development of suitable electrodes, a.c. welding is now in the ascendancy. It is cheaper and faster because of the higher current values it is capable of using.

Arc welding originally used carbon electrodes and an independent source of filler metal. The next development was to replace the carbon with a metallic electrode. These early bare electrodes are now known under the classification E45xx.

Shielded electrodes were then invented as a means of preventing oxygen contamination in the weld metal. Shieldings themselves have undergone improvement; a recent development is the low-hydrogen type. Alloying elements are also added to the shielding to improve the mechanical properties of the weld metal. Electrodes are now classified by specifications which are followed by all electrode manufacturers.

Professor Schaller touched on the welding of magnesium and other nonferrous metals by inert-gas arc welding with a nonconsumable tungsten electrode. Helium, argon or a combination of argon and helium may be used as the shielding gas. Aircomatic welding is an inert-gas process employing a consumable electrode; it is semi-automatic and uses reversed polarity direct current.

Resistance welding was first patented in the United States in about 1886. This process uses the resistance of the metal to the flow of current and requires different treatments for different metals. Much progress has been made in the past few years with this method.

Educational Program Features Substitutes

Col. Benjamin S. Mesick (Center) Introduced Chicago Chapter's Educational Program on "Critical Materials" by Explaining the "National Outlook". At left is Otto Zmeskal of Illinois Institute of Technology, chairman of the Educational Committee, and at right Braly S. Myers, committee co-chairman

Reported by Thomas S. Simms
Hotpoint Inc.,

The 1951-52 educational program of the Chicago Chapter A.S.M. was on "Critical Material—Applications and Substitutions". The keynote address was presented last October by Col. Benjamin S. Mesick, Commanding Officer of Watertown Arsenal. Colonel Mesick discussed the materials situation from the national viewpoint and presented some of the problems involved in the application of alternate materials in the current armament program. Subsequent lectures were as follows:

Nov. 5—Wrought Ferrous Materials, by Harry B. Knowlton, International Harvester Co.

Nov. 19—Cast Ferrous Materials, by C. O. Burgess, Grey Iron Founders Society, Inc.

Nov. 26—Nonferrous Materials, by I. V. Williams, Bell Telephone Laboratories.

Dec. 3—Stainless and Heat Resisting Materials, by Elmer Gammeter, Globe Steel Tubes Co.

Shows How Gas Turbine Affects Alloy Development

Reported by A. S. Vince
Royal Canadian Mint

The metallurgy of the high-temperature alloys and its relation to the development of the modern gas turbine engine was the subject of an address given by Harold V. Kinsey of the physical metallurgy research laboratories, Department of Mines and Technical Surveys, before the Jan. 8th meeting of the Ottawa Valley Chapter A.S.M.

Mr. Kinsey described the evolution of the gas turbine engine to its present status for aircraft, locomotive, naval and stationary applications.

He commented on how metallurgical engineers and mechanical engineers are combining their talents to make the gas turbine engine a source of motor power that may challenge the piston engine in every-day applications. The development of specific alloys for critical components was discussed in detail, with special reference to the conservation of scarce alloy elements.

At the close of the meeting Mr. Kinsey was presented with a medallion to commemorate his talk.

Indiana Chapters Plan Annual Spring Symposium

The Fourth Annual Spring Metals Symposium, sponsored by the combined Indiana chapters of A.S.M., will be held at Purdue University on Saturday, April 26. Theme of the symposium is "Solutions to Production Problems Resulting From Metal Shortages".

The meeting will open at 10:30 A.M. The program is divided into four 1-hr. lectures with an open informal discussion following each period.

The Muncie Chapter will act as host for the event, and further information may be secured from T. E. Hollingsworth, chapter chairman, 808 North Parkway Dr., Anderson, Ind.

Super High Speed Steel Depends on Hardness Of Vanadium Carbide

Reported by Robert W. Bishop
Metallurgical Laboratory, Eastman Kodak Co.

The great increases in tool life and cutting speeds resulting when super high speed steels are substituted for standard high speed steels were explained by W. R. Frazer, chief metallurgist of the Union Twist Drill Co., at the Jan. 14th meeting of Rochester Chapter A.S.M. On production jobs, tool life jumped four times when punching stainless sheets, eight times when drilling stainless and as much as 11 times when drilling cast iron. In many of the examples cited, both cutting speeds and tool life showed startling increases.

Giving credit to D. J. Blickwede, M. Cohen and G. A. Roberts of M. I. T., along with L. P. Tarasov of Norton Co. and P. Leckie-Ewing, his Canadian associate in Union Twist Drill Co., Dr. Frazer logically developed the reasons for the super performance of the high-carbon, high-vanadium cutting steels. Assuming that the tools are well designed and made of sound steel properly heat treated, they must retain a keen cutting edge in service at temperatures reported to be from 800 to 1500° F. This requires hot hardness and abrasion resistance. Also, toughness must be maintained to resist chipping.

Dr. Frazer stated that finer grain size and finer carbide size give better toughness. In this respect the high-vanadium steels are superior to standard cobalt types since cobalt is known to cause grain coarsening during hardening.

The hardness and abrasion resistance of cutting tools is attributed mainly to the tungsten, molybdenum and vanadium carbides in the hardened structure. Microhardness testing has indicated that the hardness of the vanadium carbide is about Rockwell C-84, whereas the tungsten and molybdenum carbides are C-77.

The vanadium carbides are slightly harder than aluminum oxide abrasives and increasing the amount of the hard carbide constituent in the basic high speed steels is responsible for improved performance. The new super high speed steels contain about 0.25 to 0.85% more carbon and 1 to 3% more vanadium than ordinary high speed steels.

In discussing specifically the machining of heat resistant alloys such as Inconel and turbine bucket alloys, Dr. Frazer indicated that good results have been obtained with Type T-15 steel (1.5% C, 12.5% W, 4.75% Cr, 5% V, 5% Co) with speeds of about 25 to 30 surface ft. per min. and with feed about double standard practice. This technique allows the cutting edge to get under any work hardening which resulted from the preceding cuts. This procedure can also be used to advantage on austenitic alloys and titanium.

Earlier in the evening Past Chairman Frank McDonald was presented with a certificate of appreciation from the members. Mr. McDonald is a charter member of the Chapter and served as chairman in 1949-50.

Ten Years Ago
Quotes From *Metals Review* March 1942

"James T. MacKenzie, American Cast Iron Pipe Co., Birmingham, Ala., has been appointed chairman of the Nominating Committee for national officers."

Today's Changing World Interpreted for Metallurgy

Reported by Paul G. Barnard
Missouri School of Mines & Metallurgy

Recent developments in the field of physical metallurgy were discussed by G. A. Fisher, Jr., head of the technical section of International Nickel's Development and Research Division, St. Louis, in a talk entitled "Today's Metallurgy for Engineers" before the Missouri School of Mines and Metallurgy Chapter A.S.M. in January.

The speaker presented a brief resume concerning the mechanical properties, available forms and uses for various heat and corrosion resistant alloys, and for the boron-treated and alloyed steels. Mr. Fisher also discussed data about iron and steel cast products, including magnesium-containing cast iron. He included a brief summary of the effects of today's world of changing metallurgy upon the careers of engineers.

Mining in Canada and New Smelter Surveyed

Reported by Walter J. Chappell
Vivian Engine Works, Ltd.

The first 1952 meeting of the British Columbia Chapter A.S.M. opened with an interesting coffee talk by Fred Stephens, associate editor of *Western Miner*. He outlined the mining situation in the northern regions of Canada, indicating its past, present and future.

The Athabaska Lake region in Northern Saskatchewan is becoming the uranium capital of Canada, Mr. Stephens pointed out. Giant Yellowknife Gold Mines, Ltd., now milling 700 tons daily, will be stepped up to 2000 tons daily to become the greatest gold producer in Canada.

The main speaker of the evening was J. S. Kendrick, assistant manager of the Kitimat Smelter. With the aid of slides the audience was transported to Kitimat and adjacent areas occupied by this huge project. All phases of this work have a direct bearing on the smelter itself. The Nechako Dam will back a lake some 150 miles in length. This water will surge through a mountain via a man-made tunnel to the hydro plant. The electricity will travel over 50 miles of power lines traversing a rugged set of mountains to Kitimat and to the smelter.

In a matter of months, vast forest regions were transformed to landing strips and camp sites. Helicopter is the main form of transportation in this project for both men and equipment. The eventual construction of the smelter, town and wharves was visualized by artists' drawings.

W. Armstrong closed the meeting with a hearty vote of thanks.

Meeting Closes; Discussion Continues

Discussion Continued After the Formal Meeting of the Cincinnati Chapter Broke up on Dec. 13. National President John Chipman and Secretary Eisenman were guests for Sustaining Members' Night. The theme of the evening was the need to interest high school students in metallurgy as a career. Dr. Chipman, principal speaker (extreme right) is engrossed in discussion with Roy McDuffie, professor of metallurgy at University of Cincinnati. (Reported by George B. Reisenberg)

Texas Past Chairmen Help Entertain National Officers

At National President's Night in Texas Are Milton W. Phair, Vice-Chairman; Charles H. Shapiro; Wade W. Hampton; F. M. Wittlinger; H. C. Dill, Chapter Chairman; John Chipman, National President; W. H. Eisenman, National Secretary; Carl S. Cook; W. E. Burndrett; K. P. Campbell; W. A. Kuenemann; Harold Schmid and C. F. Lewis. The occasion was also Past Chairmen's and Western Night (Photograph by Leland V. Dolan)

Reported by C. L. Horn
Metallurgist, Hughes Gun Co.

John Chipman, national president, and W. H. Eisenman, national secretary, joined 150 members of the Texas Chapter A.S.M. to help celebrate National Officers', Past Chairmen's and Western Night during their January meeting.

After dinner Mr. Eisenman gave a brief resume of the highlights of the First World Metallurgical Congress and response of the foreign conferees. He also presented past chairman certificates to Wes Kuenemann and Harold Schmid.

Dr. Chipman expressed the need in this country for the education of more men in the field of engineering. The shortage of engineers is acute and for the next few years the outlook for engineers to meet the demand does not look very promising. Dr. Chipman's formal address was "The Chemistry of Molten Steel" which included the practical use of the law of mass action for chemical reactions taking place in molten steel. Desulphurization was discussed at some length. After the lecture Dr. Chipman answered questions from the audience.

High-Speed Photography Illustrates Research on Sigma Welding Process

Reported by Don Rosenblatt
Chief Metallurgist, Eimco Corp.

Three-tenths of one second magnified 900 times via ultra-high speed photography resulted in an amazing four minutes for his audience as E. R. Behnke, laboratory division head of Linde Air Products Co., a Division of Union Carbide and Carbon Corp., illustrated his talk on "New Developments in Gas-Shielded Arc Welding". Mr. Behnke spoke on Nov. 29 at a combined meeting of Utah Chapter A.S.M. and American Welding Society in Salt Lake City.

The high-speed film was used to illustrate how sigma welding was adapted to ferrous materials by studying the effects of various types of "inert atmosphere" on weld metal behavior and deposition. Mr. Behnke described sigma welding in terms of operating principles, present and future applications, equipment requirements and research background.

Sigma welding does not relate to the "sigma" phase of the stainless steels—the word "sigma" is merely a short form for the cumbersome name "shielded inert-gas metal arc". This process employs automatic feeding of a consumable flexible wire electrode being arced in a pure argon atmosphere for nonferrous materials, and an argon-oxygen mixture (called argon-sigma grade) for ferrous materials.

Sigma welding, Mr. Behnke explained, makes more economical the fabrication of most commercial metals, including aluminum and copper alloys, stainless steel and carbon steel. The principal advantages are greatly increased duty factor, higher welding speeds, flux elimination, and better visibility due to the absence of smoke and spatter.

Mr. Behnke also described semiautomatic Heliarc welding which makes use of a nonconsumable tungsten electrode in conjunction with an automatically fed consumable filler rod, all encased in an inert-gas atmosphere. This process provides manual welding with mechanical precision; it combines the advantages of manual operation with full automatic welding by permitting constant welding speeds together with a high degree of flexibility. The filler rod actually initiates arc travel because the driven filler rod is pressed against the joint to be welded, therefore causing the torch to move along the joint at a predetermined speed.

Linde Air Products Co. equipment for semi-automatic Heliarc welding was described with the aid of slides illustrating comparative processes and fundamental principles. Samples of Heliarc and sigma welding equipment and weldments were on display for examination by the 100 or more in attendance.

International Congress To Be on Raw Materials

Raw materials will be the theme of the 4th International Mechanical Engineering Congress, to be held in Stockholm, June 4 to 10, 1952. The program will be designed to study improvements in raw materials used in manufacture from the designer's point of view.

The Congress will open on Wednesday morning, June 4, with a session on cast iron. Engineering steels will be considered on Wednesday afternoon and Thursday morning. Other subjects scheduled are alloy steels, Friday morning; light alloys, Friday afternoon; nonferrous metals, Saturday morning; nonmetallic materials, Tuesday morning, June 10, and the final session, on powder metallurgy, Tuesday afternoon.

Visits to metalworking plants in and near Stockholm are scheduled for Thursday afternoon and all day, Monday, June 9, and a seven-day study tour of Sweden will give participants an opportunity to visit principal industrial centers. A special Congress dinner will be held Saturday evening, June 7, with H. R. H. Prince Bertil as guest of honor.

Instrument Courses Offered

The first courses in instrument maintenance and repair to be held in 1952 by the Brown Instruments Division of Minneapolis-Honeywell Regulator Co. started on Jan. 7 at the Brown School in Philadelphia.

The schedule, according to M. J. Ladden, chief instructor, is divided into study periods of varying lengths, including a 13-week comprehensive course that will extend from Feb. 11 to May 9. Other courses will be held through June 27.

It is expected that special courses will be held for government engineers, including those from the AEC, from educational institutions and from various friendly nations. During 1951 the company maintained instructions for similar groups for practically the entire year.

THIRTY YEARS AGO

The practice of preprinting A.S.M. convention papers as a means of stimulating valuable discussion was established in 1922 with the announcement in the *Transactions* of the American Society for Steel Treating that the papers to be presented at the winter sectional meeting in New York would be preprinted for distribution to members.

— 30 —

Detroit Chapter appointed "BILLY" WOODSIDE chairman of the Convention Committee for the annual convention to be held in that city in October 1922.

— 30 —

Announcement was made that the exposition would be held in the General Motors Exhibition Hall, "which provides a room 60 x 500 feet, well equipped with electrical and gas connections". (N.b. The 1951 Detroit Metal Show was spread over 6½ acres of floor space.)

— 30 —

"Calite—a New Heat Resistant Alloy" was described in a *Transactions* paper in February 1922 by GERALD R. BROPHY, metallurgical engineer, industrial furnace department, General Electric Co. (now manager of the New England Technical Section, International Nickel Co.)

— 30 —

In the same issue A. V. DE FOREST,† research engineer, American Chain Co., describes experimental work on magnetic testing of case hardened chain to determine depth of case. An editorial in *Iron Age* commending his experimental work states: "The application of the magnetic testing idea to case hardened chain is, after all, merely a step in the development of nondestructive testing for which there has long been a demand."

— 30 —

The Rockford Chapter was established on Dec. 12, 1921, with 35 members. O. T. MUEHLEMEYER,† who was then metallurgist for Barber-Coleman Co. and later established his own heat treating company, was the first chairman. Secretary was R. M. SMITH, now metallurgist for O. T. Muehlemeyer Heat Treating Co., being carried on by O. T.'s son Carl, who became chapter chairman 25 years after his father's term of office.

— 30 —

"A problem for the future to solve is the utilization of less pure ores now known to exist in huge quantities." So states ERNEST E. THUM (then associate editor of *Chemical & Metallurgical Engineering*, now and since its beginning editor of *Metal Progress*) in a talk on "What's New in Metallurgy" given before the Pittsburgh, Milwaukee and Chicago Chapters. It took 30 years to get around to do something about this problem.

— 30 —

A "Commercial Item" states that "D. K. BULLENS, well-known author of 'Steel and Its Heat Treatment', has organized a company in Philadelphia to do heat treating work and also to act as consulting engineers." An A.S.M. Distinguished Service Award in 1948 honored Bullens for his pioneer work on the book that is still a standard text.

— 30 —

On March 1, 1922, RAY T. BAYLESS joined the headquarters staff of the then American Society for Steel Treating. Announcement by the board of directors of his appointment as editor of the *Transactions* was made in the May 1922 issue of that publication (see also page 10).

— 30 —

In 1921 Washington Chapter announced that H. E. HANDY, assistant metallurgist and superintendent, Washington Steel and Ordnance Co., found it necessary to resign as chairman of the Meetings Committee because he expected to leave Washington in the near future (doubtless to move to Biddeford, Maine, and affiliate with the Boston Chapter, which he served as secretary for more than 25 years.

— 30 —

Mr. Handy was succeeded as secretary of the Meetings Committee by J. S. VANICK, then metallurgist, Fixed Nitrogen Research Laboratories, Washington, now metallurgist for International Nickel Co. Inc., in New York.

† Deceased

Welding Competition Award Increased to $2000 Total

A grand total of $2000 in cash awards—double that of the previous year—plus a considerably increased scope of the competition to include practical welding applications, marks the announcement of the 1951-52 Prize Competition sponsored by Eutectic Welding Alloys Corp.

The competition is open to engineers, metallurgists, researchers, instructors, welders and students. Papers are solicited in two categories: "Welding Engineering and Theory," and "Practical Welding Applications." Both divisions must cover the use of low-melting filler metals in the nonfusion welding processes.

A total of thirty cash prizes will be awarded, the first prize being $500.

Further information may be obtained by writing Eutectic Welding Alloys Corp., Dept. P, 172nd St. and Northern Blvd., Flushing, N. Y.

Several Melting and Annealing Methods Used For Malleable Castings

Reported by Andrew Van Echo
Joslyn Mfg. & Supply Co.

Malleable castings can be produced by several methods of melting and annealing, James H. Lansing, technical and research director, Malleable Founders' Society, Cleveland, explained to the Fort Wayne Chapter on Jan. 14. Castings originally are "white iron", all of the carbon being in the combined form; subsequent annealing converts it into standard malleable iron.

Mr. Lansing compared air furnace melting and cupola melting. The latter, he said, is primarily used in duplex operation, mostly in conjunction with air furnaces or electric furnaces. The annealing cycle depends upon the type of equipment, which ranges from the periodic (batch) to the continuous. By using continuous annealing furnaces and electric or radiant-tube batch types, the time requirement may be reduced to 30 or 40 hr. or less. However, annealing time is only important to the user in connection with the first castings coming through, since subsequent castings become regularly available in accordance with production planning.

Malleable has a unique combination of properties that make it an ideal material for a wide diversity of applications. These properties are toughness, excellent resistance to heavy and repeated impact, and versatile castability.

The questions following the talk evinced much interest in the machinability of malleable castings. Mr. Lansing explained that, because of its easy machinability, many castings can be finished by one roughing operation.

The final portion of the meeting was devoted to a showing of "This Moving World", a technicolor sound motion picture on the malleable foundry industry.

Management Firm Expands

Several steps to expand the activities of the firm in key business centers have been announced by Booz, Allen & Hamilton, management consultants, according to John L. Burns, a member of the firm and past chairman of the Chicago Chapter A.S.M.

In line with this program a new office has been opened in Detroit at 3075 Penobscot Bldg. Edwin L. Morris is partner in charge, and James W. Bannon resident manager. A permanent location in Detroit will enable the firm to serve clients in eastern Michigan and Toledo more readily and effectively.

Hear Editor on Atomic Energy

Ernest E. Thum (Second From Right), Editor of Metal Progress, *Spoke on "Atomic Energy" at the January Meeting of the Worcester Chapter. Shown are L. P. Tarasov, Norton Co., past chairman; Wendell J. Johnson, Massachusetts Steel Treating Corp. vice-chairman; J. Walter Gulliksen, Worcester Pressed Steel Co., chairman; Carroll C. Tucker, Mathews Manufacturing Co.; Lincoln G. Shaw, Pratt & Inman, secretary-treasurer; Joseph C. Danec, Norton Co., Education Committee chairman; Ernest E. Thum; and Harold J. Elmendorf, American Steel & Wire Div., U. S. Steel, technical chairman for the meeting. (Reported by C. Weston Russell, Wyman - Gordon Co.)*

Tungsten Carbide Pays For Itself in Resisting Localized Abrasion

Reported by Arnold C. Bowers
Metallurgist, Minneapolis-Moline Co.

A film showing the manufacture of sintered tungsten carbide opened a program on "Wear, Abrasion and Tungsten Carbide" presented by Roy D. Haworth, manager of product development for the Carmet Division of Allegheny Ludlum Steel Co., before the Northwest Minnesota Chapter (formerly Northwest) on Jan. 17.

Mr. Haworth used slides to illustrate the comparative wear properties of different steels using various kinds of abrasives. The slides showed that a higher hardness does not always improve wear resistance in low-alloy steels. In fact, high hardness sometimes results in greater wear. High-carbon, high-chromium steels show a marked improvement in wear and abrasion resistance compared to low-alloy steels.

Mr. Haworth showed that abrasive wear is influenced by the size, shape and hardness of the abrasive grains. As a rule, wear declines with a drop in hardness of the abrasive grains, but sharp angular grains may produce more wear than rounded grains of moderately higher hardness.

In recent years many industries have used tungsten carbide for severe localized abrasion. The initial cost of tungsten carbide is much higher than steel, but it pays for itself in prolonging the life of the part. Ratios as high as 250 to 1 have been found in the life of carbide over steel in abrasive use. Sintered tungsten carbide dies for stamping high-silicon sheet steel last 15 to 25 times as long between grinds as high-carbon, high-chromium steel.

The price of tungsten carbide has declined from $1.00 a gram when it was first introduced in this country in 1929 to a present base price of 5½ cents a gram, Mr. Haworth stated. Today's price makes it competitive with other engineering materials for severe wear applications, as well as for machining purposes.

Minnesota Course Is on Inspection and Testing

"Inspection and Testing of Metals" was the subject of the 1952 educational series of the Minnesota Chapter A.S.M. (formerly Northwest Chapter), just completed.

All but one of the lectures were held on the University of Minnesota campus. The fifth in the series, on nondestructive testing, took place at the structural division and tractor plant of Minneapolis-Moline Co. Enrollment was free to anyone interested in attending. The list of subjects and lecturers is as follows:

Jan. 31—The Structure of Metals and Plastic Deformation, by H. S. Jerabek, Associate Professor of Metallography, University of Minnesota.

Feb. 7—Laboratory Tests for Predicting Service Behavior of Materials; and Static Properties of Materials, by B. J. Lazan, professor of materials engineering, University of Minnesota.

Feb. 14—Properties Under Nonrepetitive Loads of Abnormal Speed; and Hardness, Impact and Other Arbitrary Tests, by Professor Lazan.

Feb. 28—Fatigue and Damping Properties of Materials, by Professor Lazan.

March 6—Nondestructive Testing, by Ralph Brown, Assistant Chief Inspector, and Arnie Bowers, Metallurgical Laboratory, Minneapolis-Moline Co.

March 13—Specifications and Substitutes, by R. H. Lundquist, Supervisor of Metallurgical Department, Minneapolis-Moline Co.

Compliments

To GUILLIAM H. CLAMER, president of the Ajax Group Companies, Philadelphia; WILLIAM A. DARRAH, president of Continental Industrial Engineers, Inc., Chicago; ADOLPH W. MACHLET, chairman of the board, American Gas Furnace Co., Elizabeth, N. J.; and FREDERICK H. NORTON, professor of ceramics, Massachusetts Institute of Technology, on receipt of the Trinks Industrial Heating Award at the Midwinter meeting of the Industrial Furnace Manufacturers Association. The Trinks Award was established by *Industrial Heating* to honor Wilabald Trinks, professor emeritus of mechanical engineering at Carnegie Institute of Technology. It is presented annually to one or more candidates who are outstanding in this field.

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R. T. Bayless

To RAY T. BAYLESS, assistant secretary, American Society for Metals, and editor of the *Transactions,* on his completion on March 1 of 30 years of service on the A.S.M. staff. The occasion was celebrated by a dinner attended by some of the oldtimers on the staff. Secretary W. H. Eisenman, who had been guiding the destinies of the fledgling organization for about three years when "Doc" Bayless arrived, was host at the dinner, and exchanged reminiscences of the early days with the guest of honor.

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To MARS G. FONTANA, professor and chairman, department of metallurgy, Ohio State University, on his election as president of the National Association of Corrosion Engineers.

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To WILLIAM H. WHITE, past chairman of the Cleveland Chapter A.S.M., on his retirement as manager of tool-steel sales for the Detroit District of Allegheny Ludlum Steel Corp.

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To WICHITA CHAPTER A.S.M. and its members and officers under Chairman CLAUDE M. HAMILTON, district sales manager for Marsh Steel Corp., on the fine article covering the Chapter's activities published in the January issue of *Kansas Business Magazine.*

IMPORTANT MEETINGS

For April

March 31-April 2 — International Acetylene Association. Annual Convention, Claypool Hotel, Indianapolis, Ind. (H. F. Reinhard, Secretary, I.A.A., 30 East 42nd St., New York 17, N. Y.)

April 1-3 — American Management Association. 21st Annual Conference on Packaging, Packing and Shipping, and National Packaging Exposition, Public Auditorium, Atlantic City, N. J. (James O. Rice, Secretary, A.M.A., 330 West 42nd St., New York 18, N. Y.)

April 3-4—Instrument Society of America. Second Annual Conference on Instrumentation in the Iron and Steel Industry, Roosevelt Hotel, Pittsburgh. (Richard Rimbach, Secretary, I.S.A., 921 Ridge Ave., Pittsburgh 12, Pa.)

April 7-8 — American Management Association. Production Meeting, Hotel Statler, New York. (James O. Rice, Secretary, A.M.A., 330 West 42nd St., New York 18, N. Y.)

April 7-9—American Society of Lubrication Engineers. Annual Meeting, Statler Hotel, Cleveland. (W. F. Leonard, Secretary, A.S.L.E., 343 South Dearborn St., Chicago 4, Ill.)

April 16-18—American Gas Association. Sales Conference on Industrial and Commercial Gas, Hotel Netherland Plaza, Cincinnati, Ohio. (M. A. Combs, Secretary, Industrial and Commercial Gas Section, A.G.A., 420 Lexington Ave., New York 17, N. Y.)

April 16-18—National Petroleum Association. Semi-Annual Meeting, Hotel Cleveland, Cleveland. (E. H. Fallin, N.P.A., Munsey Bldg., Washington 4, D. C.)

April 21-22—American Zinc Institute, 34th Annual Meeting, Hotel Statler, St. Louis, Mo. (Ernest V. Gent, Secretary, A.Z.I., 60 East 42nd St., New York 17, N. Y.)

April 22—Association of Consulting Chemists and Chemical Engineers. General Meeting and Symposium, Hotel Belmont Plaza, New York. (A.C.C.Ch.E., 50 East 41st St., New York 17, N. Y.)

April 23-24—American Institute of Steel Construction. Annual Engineering Conference, Hotel Commodore, New York. (L. Abbett Post, Executive Vice-President, A.I.S.C., 101 Park Ave., New York, N. Y.)

April 21-24—Society of Automotive Engineers. National Aeronautic Meeting, Hotel Statler, New York. (John A. C. Warner, Secretary, S.A.E., 29 West 39th St., New York 18, N. Y.)

April 27-May 1—American Ceramic Society. 54th Annual Meeting, William Penn Hotel, Pittsburgh. (Charles S. Pearce, General Secretary, A.C.S., 2525 North High St., Columbus 2, Ohio.)

April 28-29—Association of Iron and Steel Engineers. Spring Conference, Netherland Plaza Hotel, Cincinnati, Ohio. (T. J. Ess, Managing Director, A.I.S.E., Empire Bldg., Pittsburgh 22, Pa.)

April 29-30—Metal Powder Association. Eighth Annual Meeting and 1952 Metal Powder Show, Drake Hotel, Chicago. (Robert L. Ziegfeld, Acting Secretary, M.P.A., 420 Lexington Ave., New York 17, N. Y.)

Steel Castings Group to Meet

The Research Committee of the Steel Castings Institute of Canada will meet in Toronto on April 9 in the King Edward Hotel.

This committee represents 17 commercial steel foundries in Canada and sponsors industry-wide research on their behalf. The work is carried out at the Mines Branch of the Department of Mines and Technical Surveys in Ottawa. It is directed by a steering committee and is carried out by B. Richardson, research metallurgical engineer.

Shortages Lead to New Alloy Steel Compositions, Boron Types Emphasized

Reported by C. L. Horn

Metallurgist, Dickson Gun Plant

A. G. Forrest, chief metallurgist, and Roy D. Allen, assistant chief metallurgist for the Chicago district, Republic Steel Corp., spoke at the first meeting of the Texas Chapter for the 1951-1952 season. The subject for the evening's discussion was "New Alloy Steel Compositions".

The speakers placed special emphasis on the boron-treated steels. The extreme shortages of nickel, molybdenum and other critical alloying elements have prompted the steel companies to produce steels with drastically reduced alloy content. The present requirements for nickel are about twice the amount available and nickel is expected to be critical for some time. The molybdenum supply is critical, and while chromium is in rather fair supply, most of it is obtained outside the United States.

When choosing a boron steel to replace another alloy steel, the speakers recommended that the first choice be made with the same or lower carbon content. This applies particularly to carburizing grades. In carburizing grades it is important that the stress relationship between the core and case be given considerable attention, since boron has the greatest effect on hardenability in the lower carbon grades. At approximately 1% carbon, the effect of boron on hardenability practically disappears.

Heat treated, through hardening, boron-treated steels require a lower tempering temperature to obtain physical properties comparable to those of an alloy steel of corresponding hardenability. The boron steels are being used successfully for axles, crankshafts, gears and many other parts.

Chemical analysis for boron in steel is long and tedious. As a result, the hardenability test is used to give a positive and practical indication of the effect of boron additions. Cast hardenability tests are taken on the teeming platform, and forged hardenability tests may be made later for confirmation.

A number of slides were shown indicating the hardenability and physical properties of various boron-treated steels as compared with other alloy steels. After the lecture, Mr. Forrest and Mr. Allen conducted a very interesting discussion based on questions asked from the floor.

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152 Enroll in New York Educational Program On Steel Heat Treatment

Six lectures on "The Heat Treatment of Steel" constituted the 1951-52 educational program of the New York Chapter A.S.M., which will be completed this month. The first three covered fundamental concepts, and the last three practical operations.

With an enrollment of 152, an excellent attendance record has been maintained. The course was free to A.S.M. members, with a $2 fee for nonmembers; high school and college students were given free passes upon request.

The course assumed no prior training in metallurgy, and was, in fact, intended for beginning students interested in metals and for practical heat treaters, machinists, and plant personnel interested in increasing their knowledge in this field. Speakers and subjects have been as follows:

Nov. 20—Introduction to Iron and Steel, by Frank T. Sisco, Technical Director, Engineering Foundation.

Dec. 4—The Iron-Carbon Diagram, by John P. Nielsen, Associate Professor of Metal Science, New York University.

Dec. 18—The Quenching Operation in Steel, by M. Gensamer, Professor of Physical Metallurgy, Columbia University.

Feb. 19—The Types of Heat Treating Operations on Steel, by N. E. Woldman, Adjunct Professor of Metallurgy, Stevens Institute of Technology.

March 4—Hardenability, by G. V. Smith, Adjunct Professor of Metallurgy, Polytechnic Institute of Brooklyn, and U. S. Steel Corp.

March 18—The Treatment of Toolsteels, by H. E. Replogle, Manager Toolsteel Sales Development, Universal Cyclops Steel Corp.

A test was given to the enrollees after the first set of three lectures, and certificates will be given after the second set to those who pass both tests.

Gives Practical Side of Nodular Iron

At the January Meeting of the Philadelphia Chapter Were Frank Ritter, Coffee Speaker on Labor-Management Cooperation; J. Russell McCarron, Chapter Chairman; T. E. Eagan of Cooper-Bessemer Corp., Principal Speaker; and Hallock Campbell, Chairman of the Program Committee

Reported by C. W. Alexander, 3rd
Metallurgist, Henry Disston & Sons, Inc.

"The Practical Aspects of Nodular Iron" were highlighted by T. E. Eagan, research metallurgist, Cooper-Bessemer Corp., before the January meeting of the Philadelphia Chapter A.S.M.

Gray iron is the basis of nodular iron, Mr. Eagan explained. The distribution of the graphite flakes determines the physical properties of the iron. Photomicrographs were shown to illustrate typical gray, malleable and ductile iron structures. Particular attention was paid to the nodular distribution of graphite in ductile iron, as contrasted with the irregular graphite patches characteristic of malleable iron.

A typical composition contains 3.40 to 3.80% total carbon, 2.40 to 3.00% Si, Mn 0.40% max., P 0.10% max., S 0.01% max., Ni 0.80 to 1.20% or 1.80 to 2.20% and Mg 0.006 to 0.08%. Sulphur is held to a minimum to avoid excessive use of the magnesium alloy. Addition of nickel increases the strength of the iron. Copper up to 0.075% is permissible, but a higher copper content tends to produce a peculiar "crowfoot" graphite flake.

Cupola furnaces are most commonly used in the production of nodular iron. Basic linings are preferred to aid in removing sulphur from the bath. The magnesium is usually added to the ladle in the form of a Ni-Si-Mg alloy. Nodular iron has excellent flowability. Its shrinkage is less than that of steel, about equivalent to gray iron. Considerable slag is produced and is difficult to remove. Clean metal is essential, for the dross on the slag will collect on the surface of the casting and is very detrimental during dynamic loading.

Tensile strength of nodular iron runs from 65 to 80,000 psi., depending on section in the as-cast condition. Annealing of the casting produces uniform tensile properties. It is possible to heat treat ductile castings to high physical properties, dependent on the shape of the casting. Nodular iron has a true stress-strain curve. The American Society for Testing Materials has now introduced a specification for nodular iron designated A339-51T.

Like a gray iron, nodular iron is highly notch sensitive in impact loading. It has five times the impact strength of gray iron using unnotched samples. The notch endurance limit is close to that of forged steel. It resists growth at high temperatures better than gray iron. Its resistance to scaling at temperatures up to 1600° F. is better than either steel or gray iron.

The successful production of nodular iron requires excellent chemical and foundry control and better than normal casting technique, Mr. Eagan pointed out in closing.

Clear Explanation of Quality Control Is Aim Of Philadelphia Course

Aim of the 1952 special educational lecture course of the Philadelphia Chapter A.S.M. is to present a clear explanation of what quality control is and how quality control is used in metallurgical industries. The title of the course is "Practical Applications of the Statistics in Laboratory and Production", and it is divided into four lectures presented each Tuesday evening during the month of March. The schedule is as follows:

March 4 — Introduction and Elementary Statistics, by W. J. Youden, Statistical Engineering Laboratory, National Bureau of Standards.

March 11—Analysis and Correlation of Test Data, by Irving W. Burr, Professor of Mathematics and Research Associate, Statistical Laboratory, Purdue University.

March 18—Quality Control in the Ferrous Metallurgical Industry, by John W. W. Sullivan, Metallurgist, American Iron and Steel Institute.

March 25—Quality Control in the Nonferrous Metallurgical Industry, by John W. Hood, Head, Quality Standards Department, Metallurgy Division, Aluminum Co. of America.

A fee of $5 is charged to nonmembers of A.S.M., which may be credited toward the first year's dues for those who wish to join the Society. Students in good standing in metallurgy classes in the Philadelphia area may register without charge. Harry N. Ghenn, metallurgist, American Viscose Corp. and assistant secretary of the Chapter, is chairman of the committee in charge of the course.

Plant Visits Supplement B. C. Lecture Course

The 1952 educational course of the British Columbia Chapter A.S.M. is being presented in collaboration with the Department of University Extension of the University of British Columbia. The course consists of an "Introduction to Process Metallurgy", illustrated by lectures, films, laboratory demonstrations and plant visits.

The course gives a brief survey of the processes for smelting, refining and fabricating iron, steel, aluminum, copper, nickel and their alloys. Discussions will center on the factors which govern the selection of metals and alloys for service applications.

Instructors are W. M. Armstrong, associate professor, and E. Morgan, lecturer, both in the department of metallurgy at the University.

Lectures are held at the University every Monday evening starting Jan. 21 and extending through March 24. Registration was limited to 50, and a fee of $10 for A.S.M. members and $12 for nonmembers was charged to help defray some of the expenses.

Among the plants visited as part of the instruction are the Vancouver Steel Co. and Vancouver Rolling Mills, Sumner Iron Works, and G. S. Eldridge Co. Testing Laboratories.

Belgians at Tool Exposition

The Belgian machine tool industry will be represented at the 9th Biennial Industrial Exposition of the American Society of Tool Engineers in Chicago March 17-21. Machines will be displayed in the booths of several Belgian manufacturers. Some of them will be represented by their American agents, while three will be represented by Belgian personnel — namely, Jean Dutrannoit of Ateliers Dutrannoit, Emile Deletaille of S. A. Mondiale, and Pol Raskin of S. A. Ateliers H. Raskin. The manager of the Belgian Machine Tool Manufacturers' Association, Mr. Franz Wolff-Cammaerts, will also attend the Exposition.

Air Hardening Toolsteels Shown to Be Versatile

Reported by S. A. Wright
Engineering Department
Eclipse Machine Division
Bendix Aviation Corp.

Speaking on "Toolsteels" before the Southern Tier Chapter A.S.M., G. E. Brumbach, metallurgist of Carpenter Steel Co., devoted most of his attention to the air hardening group. His object was to show that air hardening steels are quite versatile if they are adequately understood and proper use is made of them.

Mr. Brumbach spoke before a joint meeting of the Chapter with the New York Chapter of the American Society of Tool Engineers in Elmira on Jan. 14.

Slides were shown of the main types of air hardening steels, and charts were used to compare dimensional changes of oil and air hardening steels before and after tempering. The speaker explained ways to prevent cracking of dies and punches during heat treatment. The internal stresses created while hardening were explained for air hardening versus oil versus water quenching.

Cold hobbing is used for manufacture of dies, molds, and cavities for die castings and plastic molding. This process has proven to be satisfactory if the proper steel is used and understood. Many of Mr. Brumbach's thoughts on this subject will be found in the November 1951 issue of *Machinery*.

A valuable question and answer period concluded the meeting.

Sensitivity a Factor in Nondestructive Testing

Reported by Wells E. Ellis
Research Metallurgist, Steel & Tube Div.
Timken Roller Bearing Co.

The successful application of a nondestructive test depends upon an established correlation with certain destructive tests, according to S. A. Wenk of Battelle Memorial Institute, who presented a talk on "Nondestructive Testing of Engineering Materials and Parts" before the Jan. 8th meeting of the Canton-Massillon Chapter A.S.M.

In setting up test methods, both the reliability of the equipment and the operator must be considered and the sensitivity of a nondestructive test is a factor to be kept in mind in the over-all economics of the process. Mr. Wenk pointed out that the basic factors common to most nondestructive tests are an energy source, modification or change in that energy, and detection, recording, and interpretation of the change.

The familiar Coca Cola dispensing machine was cited as an example of the application of various nondestructive tests. The coin is automatically sized, weighed, checked for composition, examined for holes, and the modulus of elasticity examined before the Coke is delivered.

Mr. Wenk also discussed various types of tests including X-rays and xeroradiography, magnaflux, statiflux, magnaglo and ultrasonic. Following a question and answer session, representatives from the Magnaflux Corp., Bransom Instruments, and Sperry Products demonstrated nondestructive test equipment.

"Why" of Physical Met. Studied at Toronto

A series of lectures on "Physical Metallurgy", given under the auspices of the University of Toronto, constituted the fall educational program of the Ontario Chapter A.S.M. Bruce Chalmers, professor of physical metallurgy at the University, was the lecturer and course director.

The program consisted of 20 classes meeting two evenings a week. The fee for the course was $15.

Purpose of the lectures was to provide an understanding of the mixture of practice and theory known as physical metallurgy. It was designed to explain the various processes, such as forging, welding and heat treating, that are so important in industrial practice. The emphasis throughout the course was "why" rather than "how", although frequent references were made to the practical applications of the principles under discussion.

Because of the fact that the Ontario Chapter includes many members living at some distances from Toronto, it was decided that the chapter should subsidize travel to and from the meetings. As a result, one group traveled from Hamilton and one from St. Catherines and attended all the lectures. Out-of-pocket expenses for these trips were paid by the chapter.

Schedules Diffraction School

North American Philips Co., Inc., will hold its 12th X-ray Diffraction School at the company's plant, 750 South Fulton Ave., Mt. Vernon, N. Y., during the week of April 21 through 25.

Basic subjects to be covered by prominent educators and scientists will include X-ray diffraction, new high and low-temperature camera techniques, fluorescence analysis, Geiger-counter X-ray spectrometer, electron microscopy and electron diffraction. Those who are interested should register with the company as soon as possible.

Amusement Livens Toolsteel Talk

Humor Was Very Much in Evidence at the Boston Chapter Meeting Addressed by A. Dudley Bach of New England Metallurgical Corp. Left is Dow Robinson, chapter chairman, and right Sidney Baylor, technical chairman for the meeting. (Photograph by H. L. Phillips)

Reported by John L. Morosini
D. A. Stuart Oil Co.

An overflow crowd of more than 200 members and guests attended the Feb. 1st meeting of the Boston Chapter A.S.M. Dudley Bach, a past chairman, and president of New England Metallurgical Corp., presented a review of the toolsteel business in New England. In an amusing manner, he explained how the metal working industry started with plain high-carbon toolsteels and eventually went into the high speed types. Mr. Bach also presented many colored slides showing the hardening ability of the various types of steel.

William Collins, chairman of the Educational Committee, had as his guests the three top men in the State Public Trade School, plus many of their instructors who have taken the A.S.M. lecture course held at Massachusetts Institute of Technology during the past four weeks.

Past Chairmen Feted by Rocky Mountain Chapter

Past Chairmen Honored by the Rocky Mountain Chapter Are J. K. Garretson of Republic Steel Corp. (1946-47), James Colasanti of Metal Treating & Research Co. (1949-50), C. B. Carpenter, Professor of Metallurgy, Colorado School of Mines, George E. Lundberg of Colorado & Southern Railway Co. (1951-52), J. L. Higson of Western Foundry (1947-48), Curtis C. Drake of Griffin Wheel Co. (1944-45), H. E. Fryer of U. S. Steel Co. (1948-49), and Telfer E. Norman of Climax Molybdenum Co. (1943-44)

Reported by Quentin Dyce
Denver Fire Clay Co.

The first Past Chairmen's Night of the Rocky Mountain Chapter A.S.M. was held on Dec. 21 at the Oxford Hotel, Denver.

The seven past chairmen present were treated to a steak dinner. (It was regretted that Founder Chairman Ray McBrian of the Denver & Rio Grande Western Railway and Past Chairman Floyd Anderson of the Gardner-Denver Co. were out of the city.)

After dinner a new movie on the manufacture of stainless steel was shown through the courtesy of Republic Steel Corp. Chairman George Lundberg then gave a brief biographical sketch of each past chairman and an outline of the activities during each year. The past chairmen responded in turn.

Titanium no Cure-All but Occupies Definite Place As One Of Useful Metals

Reported by J. M. Hoegfeldt
Haynes Stellite Co.

Titanium is not a super-material or a "cure-all" but it occupies a very definite and distinct place in the family of useful metals. With this as the keynote, the role of titanium and its alloys was explained by Bruce W. Gonser, assistant director of Battelle Memorial Institute, Columbus, at the Dec. 11th meeting of the Purdue Chapter A.S.M.

The relative abundance of titanium in the earth's crust should make it one of the most widely used of all metals, if only an inexpensive method of extraction could be developed. The present most common method of titanium production employs conversion of titanium in the ore to $TiCl_4$ with the chloride being reduced with magnesium to form titanium powder. Pure titanium has been produced on a pilot plant scale by decomposition of a titanium halide, which then decomposes on a hot tungsten, molybdenum or titanium surface.

The principal uses of titanium will be with alloying additions. Commercial titanium containing normal amounts of impurities has a tensile strength of 80,000 psi. annealed, and 120,000 psi. after 50% reduction. Most metals alloy easily with titanium.

Titanium undergoes a phase change from the hexagonal close-packed structure to the body-centered cubic at 1628° F. The alpha phase, stabilized by N, O, C, Al, Pb, In, Sn, Ag or Zr additions, has fair strength, and good weldability and toughness.

For greatly increased strength, beta phase formers such as Cb, Co, Cr, Cu, Fe, Mn, Mo or others are added. Carbon additions up to the solubility limit, about 0.20%, increase the strength of titanium and may be a desirable constituent. Because of its adverse affect on ductility and weldability, the carbon content of wrought alloys is kept below 0.25%, and below 0.10% for welded parts.

At high temperatures, titanium and its alloys lose strength rapidly, and above about 1400° F. an accelerated absorption of oxygen and nitrogen causes early failures. These alloys have useful strength at moderately elevated temperatures, up to 1100 to 1200° F.

The present problems pertaining to titanium and its alloys are its lack of homogeneity in some alloys and structures, poor weldability of beta phase alloys, poor machinability, and the tendency to confuse titanium fabricating with steel fabricating.

Titanium is expected to take its place as a useful metal filling the gap between the light alloys and the various steels, Dr. Gonser stated at the close of his presentation.

Fred C. Kroft, Jr., chief inspector at the Haynes Stellite Co., served as technical chairman of the meeting and led the after-speech discussion.

Chapter Changes Name

A petition by the Northwest Chapter to change its name to Minnesota Chapter was granted by the A.S.M. Board of Trustees at its meeting in Pittsburgh on Jan. 30. The action was taken to avoid confusion with our far western areas in Washington and Oregon commonly known as the Pacific Northwest, or simply the Northwest.

Utica Drop Forge & Tool Announces Scholarships

As a practical means of encouraging young men to secure training to prepare themselves for industrial careers, ten annual scholarships have been offered by Utica Drop Forge & Tool Corp.

The scholarships, covering residence and subsistence at the State University of New York, provide for two school years of training in the University's department of mechanical technology at Utica, which is part of the New York State Institute of Applied Arts and Sciences. In addition, each student is expected to work in a manufacturing plant during the summer months to supplement his studies by practical on-the-job training.

Awards of the ten scholarships to outstanding students at the University have already been made for the current school year. Two similar awards have also been made to employees of Utica Drop Forge & Tool Corp.

Shell Molding Saves Machining Cost by Close Tolerances

Reported by W. N. Rice
Inspector, Bethlehem Steel Co.

"Shell Molding", while definitely not a cure-all, has distinct advantages in the production of large numbers of precision castings of limited size. Details of the process were described by Bernard M. Ames, senior metallurgist, New York Naval Shipyard, at a joint meeting of the Lehigh Valley Chapter A.S.M. and the newly organized Lehigh Valley Foundrymen's Association on Jan. 4. D. E. Best, foundry superintendent of Bethlehem Steel Co., served as technical chairman for the meeting.

In the shell molding process, a thin, permeable mold (1/8 to 1/4 in. thick) is usually produced in two halves by pouring a dry mixture of a fine silica sand and a synthetic resin over a heated metal pattern. The temperature and time are adjusted so as to fuse the plastic and provide a bond for the sand. The green mold, while still on the pattern, is cured in an oven in a short time at a closely controlled temperature. The two halves of the mold, complete with suitable gates and risers, are assembled and put into a flask where they are backed up with shot to provide support for the mold while it is poured.

Shell molding is suited to a wide variety of metals, both nonferrous and ferrous. Castings can be produced to much closer tolerances than with ordinary sand molds. (Tolerances varying from 0.003 to 0.035 in. per in. are practical.) Because of this, and also because of the good surface finish produced, much of the usual machining cost can be saved. Another advantage lies in the fact that relatively unskilled labor can be employed.

A disadvantage is the necessity of producing a metal pattern complete with gates, risers and a good surface finish to much closer tolerances than are usually encountered in a pattern shop. At the present time, most of the development is being carried out on small castings under 150 lb. Considerable care and experimentation are necessary to develop suitable gating and risering practices for each casting; applications are therefore limited to products where the development costs can be spread over a large number of castings.

The shot used to back up the molds is expensive and efforts are being made to develop substitutes. On a production basis, mechanical means of jogging the flask to place the shot and to introduce the shot in the flask are a necessity.

Feature of the coffee period which followed the dinner was an excellent colored motion picture depicting the facilities and operations of the Lebanon Steel Foundry.

Toolsteel Warehouse Added

Columbia Tool Steel Co., Chicago Heights, Ill., producers of high speed alloy and carbon toolsteel, recently announced the completion of a new branch warehouse at 4832 S. Kedzie Avenue, Chicago 32.

The new building consists of a sales office and distributing warehouse and has approximately 8000 sq. ft. of area. Richard W. Miller, vice-president of the company, is in charge. This addition makes a total of six distributing warehouses in the central west for this toolsteel organization.

294 in Dayton Course

Dayton Chapter A.S.M. concluded a highly successful educational course on "Principles of Heat Treatment" last December. Of the 294 enrolled in the course, 241 were nonmembers of A.S.M. employed in local industry. Certificates for 100% attendance were earned by 98 members of the class.

The enrollment fee of $3.50 covered cost of the textbook. An outline of the course was published in the November issue of *Metals Review*, page 16.

Australian Support for Next W. M. C. Assured

Australian support of the next World Metallurgical Congress has been assured by E. G. Love, secretary of the Australian Institute of Metals in Melbourne. In a recent letter to A.S.M. Secretary W. H. Eisenman, Mr. Love writes:

"On behalf of this Institute I must thank you for the very excellent manner in which you received the Australian delegation. The banner which you so kindly handed to Professor Worner* will be displayed at our annual meeting, and we are arranging for him to give us a short talk on some aspects of the Congress.

"I would also like to state that it is the view of the Federal Executive that a congress of this nature should be held at least every five years, and should your society have in mind repeating this function, the support of the Australian Institute of Metals can be assured."

*Howard Knox Worner, professor of metallurgy at University of Melbourne, was a member of the Australian delegation to the first World Metallurgical Congress in Detroit last October.

Student Group Elects Officers

The 49 Members of the A.S.M. Student Group at Illinois Institute of Technology Elected These Officers to Serve the Remainder of the School Year. From left they are Ramin Berg, treasurer; D. R. Adolphson, vice-chairman; E. E. Haack, chairman; and L. J. Scheer, secretary

Reported by Braly S. Myers
Chairman, Student Affairs Committee
Chicago Chapter

The newly formed Chicago Student Group of A.S.M. junior members at Illinois Institute of Technology elected officers to serve during the remainder of the 1951-52 school year. These officers are Ernest E. Haack, chairman; Don Adolphson, vice-chairman; Lewis J. Scheer, secretary; and Ramin Berg, treasurer.

A joint meeting of these officers and the Chicago Chapter Student Affairs Committee was held on Jan. 15. Tentative bylaws were written and plans were made for at least two regular meetings of the group to be held on the Illinois Tech campus during the spring. One is to be a technical meeting with a local speaker, and the other a business meeting, including election of officers for next year.

Of the 67 metallurgical engineering students at the Institute who are eligible for junior membership, 49 have already joined the group.

Members of the Student Affairs Committee are Paul Gordon, Charles Parcells, Harvey H. Curtis, Robert E. Wahlstrom, secretary; Otto Zmeskal, vice-chairman; and Braly S. Myers, chairman.

Edward G. Mahin of Notre Dame Dies, Was Past National Trustee of A.S.M.

Edward G. Mahin, 75, retired head of the department of metallurgy of Notre Dame University, and a past trustee of the American Society for Metals, died in a South Bend hospital on Feb. 4. He had been suffering from a heart ailment.

Dr. Mahin received both his B. S. and his M. S. degrees from Purdue University, in 1901 and 1903, respectively, and his Ph. D. degree from Johns Hopkins University, in 1908. Purdue awarded him an honorary D.Sc. degree in 1950.

Dr. Mahin joined the Purdue staff immediately after graduating and was appointed professor of analytical chemistry in 1914. He aided in the formation of the graduate school at Purdue and was the first chairman of the graduate council. In 1925, he went to Notre Dame where he organized the department of metallurgy and served as its head until his retirement in 1949. At Notre Dame he also served on the Graduate Committee which he had helped to form in the late 20's.

He was the author of five books and a large group of scientific papers. A member of nearly a dozen scientific, chemical, and metallurgical societies,

Edward G. Mahin

he achieved the honor of being president of the Indiana Academy of Sciences in 1928, and Notre Dame awarded him the Distinguished Teacher award. Among his honors were memberships in Phi Beta Kappa, Sigma Xi, Tau Beta Pi, and Phi Lambda Upsilon.

Dr. Mahin was the father of William E. Mahin, director of research at the Armour Research Foundation of Illinois Institute of Technology, Chicago.

William H. Oldacre Dies; Was Stuart Oil President

WILLIAM H. OLDACRE, president and general manager of the D. A. Stuart Oil Co., Chicago, died on Jan. 18. Mr. Oldacre had been associated with Stuart for almost 32 years, and was director of research before becoming president.

W. H. Oldacre

Mr. Oldacre has been a frequent speaker before A.S.M. chapters on cutting fluids and metalworking problems, a field in which his previous shop and engineering experience proved of value. He was a graduate of Hiram College and an honorary member of Pi Tau Sigma, national mechanical engineering fraternity, as well as a number of technical societies.

Morris E. Leeds

MORRIS E. LEEDS, founder and chairman of the board of Leeds & Northrup Co., Philadelphia, died Feb. 8 at the age of 82. He was a member of a number of technical societies, including A.S.M., and had been frequently honored for his contributions in the field of recording and control instruments.

He was a recipient of the Edison Medal of the American Institute of Electrical Engineers, the Edward Longstreth Medal of the Franklin Institute, the Henry Lawrence Gantt Medal of the Institute of Management, and the Annual Award for leadership in industrial relations of the Philadelphia Chamber of Commerce. He held honorary degrees from Haverford College and Brooklyn Polytechnic Institute.

Watch Industry Typifies Metallurgy in Miniature

Reported by S. C. Hayes

Armco Steel Corp.

H. L. Hovis, chief chemist, Hamilton Watch Co., at the January meeting of the Baltimore Chapter described some of the chemical and metallurgical problems encountered in the watch industry. Although many common processes are used, such as melting, rolling, cold drawing, heat treating, machining and plating, the properties required of the materials and the size of the parts involved tax the ingenuity of the metallurgist and the chemist and elevate their work to a fine art—of super craftsmanship.

"Metallurgy in Miniature" was the appropriate title of Mr. Hovis's talk. The Chapter was impressed with the scope of metallurgy covered, both ferrous and nonferrous, and especially with the techniques used in solving some critical problems. For example, how do we harden and temper high speed toolsteel drills 0.0072-in. in diameter without decarburization or size loss? How punch a hole 0.012-in. round in a 1.00% carbon steel 0.024-in. thick? How bright harden and draw tiny watch parts?

What alloy will make the best hairspring, requiring constant elastic properties unaffected by temperature changes, corrosion, and magnetic fields? Consider the problem of electroplating small screws, and of cleaning and polishing such small parts. Finally, of course, a fine watch must be assembled from interchangeable parts.

F. C. Frary to Head New Metals Advisory Board

A new Minerals and Metals Advisory Board has been organized under the National Academy of Sciences-National Research Council. This board will serve as a research advisory group to the Department of Defense and to civilian governmental agencies responsible for research and development in mineral technology and metallurgy for the defense effort.

Francis C. Frary, recently retired director of research and now technical advisor of the Aluminum Co. of America, will head the new board as chairman. Zay Jeffries, retired vice-president of General Electric Co., and Robert F. Mehl, director, metals research laboratory, Carnegie Institute of Technology, will serve as vice-chairmen.

The board has been formed by a reconstitution of the Metallurgical Advisory Board that has been advisory over the past year to the chairman of the Research and Development Board, Department of Defense, on problems of metallurgical research. The new board will continue this advisory service and will have the added responsibility of advising civilian defense agencies through the director of the Bureau of Mines.

The scope of the new board's interests is expected to cover the production and use of metallic and nonmetallic minerals, the treatment of low-grade minerals and ores, production of raw materials and intermediates, and use of substitutes, as well as advisory services with respect to the entire field of metallurgical research.

New Names Added to Quarter-Century Club

The following A.S.M. members have been awarded honorary certificates commemorating 25 years' consecutive membership in the Society:

Dayton Chapter—Chester L. Gillum, J. B. Johnson, Richard R. Kennedy, B. C. Morris, George J. Oswald, Harold A. Towner. Dayton Power & Light Co. and Ohio Steel Foundry—sustaining members.

Toledo Chapter—Harry H. Heinisch.

International—William Barr, Arthur Blagden, Sir W. T. Griffiths, Thomas R. Kidd, F. W. Patterson.

Worcester Executives at Business Meeting

The Entire Membership of Worcester Chapter's Executive Committee Was Represented at a Recent Business Meeting. Standing are Orum R. Kerst, E. F. Houghton & Co. (past chairman); James F. Dempsey, Bay State Products Co.; Herbert D. Berry, Thomas Smith Co.; Robert S. Morrow, George F. Blake, Inc. (past chairman); Harold J. Elmendorf, American Steel & Wire Division; Harold B. Bell, Worcester Stamped Metal Co.; Roland C. Wennerberg, General Machine Tool Co.; Chester M. Inman, consulting engineer (chairman emeritus); Roland E. Ljungquist, Ledding Engineering Corp.; George W. Coleman, Snell Mfg. Co.; and Stephen M. Jablonski, Wyman-Gordon Co. Seated are Joseph C. Danec, Norton Co.; Wendall J. Johnson, Massachusetts Steel Treating Corp. (program chairman); J. Walter Gulliksen, Worcester Pressed Steel Co. (chairman); and Lincoln G. Shaw, Pratt & Inman (secretary-treasurer of the chapter)
(Photograph by C. Weston Russell, Wyman-Gordon Co.)

Illinois Tech Gives Course For Koppers Employees

Two hundred and fifty employees of the Freyn engineering department of Koppers Co., Inc., are taking a special course in steel engineering principles at Illinois Institute of Technology. The Freyn division is engaged in the design of steel plants. Announcement of the 17-week evening course that began Jan. 15 was made by Otto Zmeskal, director of metallurgical engineering at Illinois Tech.

Outstanding men in the Chicago area's steel industry have been selected to serve as guest lecturers.

Titanium Producer Moves

Mallory-Sharon Titanium Corporation has moved its general offices from Indianapolis to Niles, Ohio, according to an announcement by James A. Roemer, company president.

The titanium melting furnace now located in Indianapolis is being moved to Niles. Three new furnaces to be installed at Niles will bring available titanium melting capacity at Mallory-Sharon to two million pounds in 1952. Also, during 1952, the laboratory, engineering, and research work on titanium which is presently being carried out in Indianapolis will be established in Niles.

"Steel Peddler" Reminisces For Old-Timers in L. A.

Reported by E. R. Stauffacher
Southern Calif. Edison Co.

On Jan 24 Mr. Earl M. Jorgensen, president of the Earl M. Jorgensen Co., presented some "Reminiscenses of a Steel Peddler" before the Los Angeles Chapter A.S.M. The meeting was a combination Sustaining Members and Old-Timers Night, and special honor was given to these groups in the Chapter.

About 250 members and guests attended the meeting. They learned that the Los Angeles Chapter now has 71 sustaining members out of a total membership of about 600. Recently 20 new active members have been added and eight junior members from the local universities have joined the chapter.

Mr. Jorgensen recounted his experience in the steel business and the activities of the Los Angeles Chapter in the early days. His work along the Pacific Coast since he started in the business of selling steel in 1924 has been closely connected with the growth of the steel industry in the West.

His account of the early difficulties which were faced and the lasting friendships which were made during his career were most interesting and thoroughly enjoyed by all of his listeners.

Twenty Years Ago

Quotes From *Metals Review* March 1932

"An association of business magazine publishers at a meeting in Chicago on Jan. 25 studied *Metal Progress* as an outstanding example of typography and design in the business paper field. . ."

Nelson Named Works Manager

Marvin L. Nelson, past chairman of the Des Moines Chapter A.S.M., has been appointed works manager of Solar Aircraft Co.'s new 300,000-sq. ft. Wakonda Works in Des Moines, Iowa.

Mr. Nelson was formerly chief engineer at the Grand Ave. Works. He is a graduate of Iowa State College with a degree in Industrial Engineering. He joined Solar ten years ago, first as an estimator, with subsequent promotion to tooling and experimental engineer.

To Build Galvanizing Mill

A new $2½ million continuous galvanizing plant will be under construction shortly at Martins Ferry, Ohio, it was announced by J. H. McElhinney, vice-president in charge of operations of Wheeling Steel Corp.

The new plant will be equipped to produce large tonnages of galvanized sheets in coils 3000 to 4000 ft. in length.

Six Scholarships Established

Ceco Steel Products Corp., national manufacturer of metal construction products and building materials, has established six two-year engineering scholarships divided equally between the University of Illinois, Purdue University and Illinois Institute of Technology. Each scholarship is for the junior and senior years and is worth $1000.

New Films

Corrosion in Action

A new sound-color film, prepared under the direction of the International Nickel Co. is entitled "Corrosion in Action". It shows how corrosion causes an annual 6-billion-dollar loss, and how this damage can be avoided or controlled.

The picture is in three parts of two reels each, so arranged that any single part or any combination can be shown. Each part requires 20 min. Bookings can be made through the Corrosion Engineering Section, International Nickel Co., Inc., 67 Wall St., New York 5, N. Y.

CHAPTER MEETING CALENDAR

CHAPTER	DATE	PLACE	SPEAKER	SUBJECT
Baltimore	Apr. 21	Engineers Club	J. L. Kimberley	Continuous-Cast Alloy Products
Birmingham	Apr. 2	Hoopers Cafe		(Sustaining Members' Night)
Boston	Apr. 4	Simonds Saw & Steel Co., Fitchburg	A. H. d'Arcambal	Thirty Years of Toolsteel (Plant Visit)
Buffalo	Apr. 10	Hotel Sheraton	W. Wheadon	Testing, Conventional and High Temperature
Calumet	Apr. 8	Phil Smidt & Son, Whiting, Ind.	Beth Peterson	Synthetic Fibers (Ladies' Night)
Canton-Massillon	Apr. 1	Mergus Restaurant		Jet Engines
Chattanooga	Apr. 8	Park Hotel	E. A. Mallet	Design for Tooling of Resistance Welding Machines
Chicago	Apr. 14	Furniture Club	H. H. Miller	The Control of Tool Materials
Cincinnati	Apr. 9	Dayton, Ohio		Recent Developments in Metals (Tri-Chapter Meeting)
Cleveland	Apr. 7	Hotel Hollenden	E. C. Bain	(Zay Jeffries Night)
Columbus	Apr. 9	Dayton, Ohio		Recent Developments in Metals (Tri-Chapter Meeting)
Dayton	Apr. 9	Engineers Club		Recent Developments in Metals (Tri-Chapter Meeting)
Detroit	Apr. 14	Rackham Bldg.	E. H. Dix, Jr.	Light Alloys in Today's Aircraft
Eastern N. Y.	Apr. 15	Circle Inn Lathams, N. Y.	Roger Clark	Welding
Fort Wayne	Apr. 14	Howard Johnson's	Samuel Epstein	Deep Drawing Steels
Georgia	Apr. 7	Atlantic Steel Co.	D. J. Girardi	Electric Furnace Steel Practice
Hartford	Apr. 8	The Hedges, New Britain, Conn.	J. Y. Riedel	Toolsteels
Indianapolis	Apr. 21	McClarney's Rest.	M. J. Day	Hardenability Control and Its Application
Inland Empire	Apr. 15	Wright's Diner	F. R. Morrall	Metallurgical and Chemical Industries in Spain
Lehigh Valley	Apr. 4		F. G. Tatnall	Relation Between Engineering and Metallurgy
Los Angeles	Apr. 24	Rodger Young Audit.	G. D. Welty	Light Alloy Forgings in the Aircraft Industry
Louisville	Apr. 1	Seelbach Hotel	John Mitchell	Historical Aspects of Alloy Steel Business
Mahoning Valley	Apr. 8	Post Room, V. F. W Youngstown, Ohio	C. P. Larrabee	Corrosion of Low-Alloy Steel and High-Strength Steels
Milwaukee	Apr. 15	Wisconsin Hotel	L. D. Jaffe	Brittle Failures of Steel
Minnesota	Apr. 17	Covered Wagon	J. F. Cerness	Metallurgical Inspection of Ferrous and Nonferrous Composites
Montreal	Apr. 7	Queen's Hotel	G. O. Hoglund	Aluminum Welding
Muncie	Apr. 8		M. M. Judkins	Powder Metallurgy
New Haven	Apr. 17	Heppenstall Co. Bridgeport	Glenn F. Whiteley	Open-Die Forgings—Their Manufacture and Testing
New Jersey	Apr. 21	Essex House, Newark	R. R. Moore	New Concepts of Fatigue or Brittle Failure
New York	Apr. 14	Schwartz Rest.	H. J. French	Correlation of Tests and Service (Past Chairmen's Night)
Northern Ont.	Apr. 16	Windsor Hotel Sault Ste. Marie	H. Thomason	Steel Embrittlement and Stress Analysis
Notre Dame	Apr. 9		E. E. Thum	Metallurgical Aspects of Atomic Energy
Oak Ridge	Apr. 16	K of C Hall Jefferson Circle	T. C. DuMond	Technical Publications
Ontario	Apr. 4	St. Catharines	W. C. Winegard	Metallurgical Applications of Atomic Energy Byproducts
Ottawa Valley	Apr. 8	P.M.R. Labs.	W. B. Lewis	Nuclear Physics and Metals
Penn State	Apr. 8	School of Mineral Ind., Art Gallery	Weber deVore	Cold Extrusion of Steel
Peoria	Apr. 14	American Legion Bldg., Morton, Ill.	Ray McBrian	Service Failures and Their Solution-Railroad Metallurgical Materials
Philadelphia	Apr. 25	Engineers Club	W. M. Baldwin, Jr.	Strength of Materials
Pittsburgh	Apr. 10	Roosevelt Hotel	C. F. Hood	Fairless Works of U. S. Steel (Young Fellows' Night)
Purdue	Apr. 26	Purdue University		Solutions to Production Problems Resulting From Metal Shortages (Annual Spring Symposium of Combined Indiana Chapters)
Rochester	Apr. 14	Howard Johnson's Rest.	Peter Payson	The TTT-Curve as a Guide to the Heat Treatment of Steels
Rocky Mountain Pueblo / Denver	Apr. 17 / Apr. 18		Elmer Gammeter	Manufacture of Tubing (Sustaining Members' Night)
Rome	Apr. 7	Hotel Utica	E. S. Rowland	Survey of Boron in Steel
Saginaw Valley	Apr. 15		George H. Found	Fatigue and Its Relation to Service Life
St. Louis	Apr. 18	Stratford Hotel Alton, Ill.	Max Hansen	Titanium
Springfield	Apr. 21	Sheraton Hotel	Ralph Kennedy, Jr.	Application and Uses of High Speed Steels
Southern Tier	Apr. 7	Corning Glass Center	N. J. Grant	High-Temperature Alloys
Terre Haute	Apr. 7			Induction Heating
Texas	Apr. 1	Ben Milam Hotel	C. P. McShane	Tool and Die Steel

Toledo	Apr. 10	Maumee River Yacht Club	A. F. Sprankle	Effect of Alloying Elements on Fabrication of Steel Parts
Tri-City	Apr. 1		Otto R. Hills	Design and Manufacture of Springs
Tulsa	Apr. 14		E. O. Dixon	Forgings
Utah	Apr. 24	Salt Lake City	Porter Wray	Boron Steels
Washington	Apr. 14	Old New Orleans Rest	C. H. Sample	Corrosion Behavior and the Protective Value of Electrodeposited Coatings
West Michigan	Apr. 21			Plant Tour
Worcester	Apr. 16	Wachusett Country Club	H. F. G. Ueltz	All About Glass (Ladies' Night)
York	Apr. 9	Gettysburg, Pa.	R. M. Brick	Quick Watson, The Micro

A.S.M. Budget Allots 75% To Its Educational And Publishing Activities

Reported by Quentin Dyce
The Denver Fire Clay Co.

Since the origin of A.S.M. in 1913, the work of the organization has been primarily concerned with education in the metal field. This point was brought out by Ray T. Bayless, assistant secretary of the American Society for Metals, in an address on "Training Metal Engineers" before the Rocky Mountain Chapter on Jan. 18.

With this emphasis in mind, the budget of A.S.M. is divided in such a way that 75% of the expenditures go directly into publications and other educational programs. Local chapters aid in the program by conducting educational series on selected subjects in addition to their monthly meetings—a practice active in about 50% of the chapters. The national office will gladly assist any chapter in preparing an educational program by supplying slides, pamphlets, and printed and visual aids.

Three levels of education are supported by the Society. They are the activities at teacher or research level, activities at college, and activities at high school and secondary levels.

The teacher level takes in such activities as seminar courses and other advanced studies not readily understood by undergraduates. The college level covers the field of general information that may be of assistance to students in keeping up with present advances in science as well as basic information published in articles or illustrated with slides. Activities on the secondary level are largely promotion such as educating the high school student to appreciate what metallurgy is.

The fact that United States industries can absorb about 60,000 engineers per year and only about 12,000 will be available in 1954 (if the present trend continues) shows that the secondary level of education is becoming more and more important. Through awards, booklets, slide illustrations, motion pictures, and other methods, the potential metallurgical engineer is shown the possibilities of this career.

To conclude the program Mr. Bayless showed one of the new motion pictures produced by A.S.M. on "Iron-Carbon Alloys". The picture is in technicolor and uses animated examples of how slight changes in carbon affect the properties of iron as portrayed by the iron-carbon diagram.

B & W Tube Transferred

The Babcock & Wilcox Tube Co. has transferred its assets and business to the Babcock & Wilcox Co. and is being operated as the company's Tubular Products Division.

For Order Form and Technical Papers To Be Included In The WMC Volume See Opposite Page

Full Texts of the Following Technical Papers will appear in the WMC Proceedings

PHOSPHORUS DEOXIDATION OF MOLTEN COPPER, W. A. Baker, Res. Mgr., British Non-Ferrous Metals Research Assoc., London.
PHASE CHANGES ASSOCIATED WITH SIGMA FORMATION IN 18-8-3-1 CHROMIUM - NICKEL - MOLYBDENUM - TITANIUM STEEL, K. W. J. Bowen and T. P. Hoar, Dept. of Metallurgy, Univ. of Cambridge, England.
BELGIAN PRACTICE FOR PRODUCING BESSEMER STEEL LOW IN NITROGEN AND PHOSPHORUS, Pierre Coheur, Metallurgy Dept., Univ. of Liege, Belgium.
CRYSTAL ORIENTATION IN COLD-ROLLED SILICON-IRON SHEET, I. Gokyu and H. Abe, University of Tokyo.
AN INTERPRETATION OF THE HYSTERESIS LOOPS IN A_3 AND A_4 TRANSFORMATIONS OF PURE IRON, Kôtarô Honda and Mizuho Satô, Honda Laboratory, Scientific Research Inst., Tokyo.
RAPID ANALYSIS OF HYDROGEN IN MOLTEN STEEL BY VACUUM FUSION METHOD, Yoshio Ishihara and Shigeki Sawa, Japan Special Steel Co., Tokyo.
DEEP-DRAWING LIMITS FOR RECTANGULAR ALUMINUM BOXES, Toshisada Ishikawa, Nippon Aluminum Mfg. Co., Ltd., Osaka, Japan.
THE ALLOTROPY OF COBALT, A. G. Metcalfe, Res. Metallurgist, Deloro Smelting and Refining Co., Ltd., Deloro, Ont., Canada.
STUDY ON AGE-HARDENING, Yoshitsugu Mishima, Faculty of Engineering, Univ. of Tokyo.
MAGNETIC MEASUREMENTS OF AGE-HARDENING OF IRON-MOLYBDENUM ALLOYS, Tokushichi Mishima, Ryukiti R. Hasiguti and Yasuo Kimura, Faculty of Engineering, Univ. of Tokyo.
ELIMINATION OF YIELD POINT PHENOMENA BY TEMPER ROLLING AND ROLLER LEVELLING, N. H. Polakowski, University College, Swansea, Gr. Britain.
THE MECHANICAL PROPERTIES OF IRON AND SOME IRON ALLOYS OF HIGH PURITY, W. P. Rees, National Physical Lab., Teddington, Middlesex, England.
A PROPOSED STEEL MAKING PROCESS, Alessandro Reggiori, Inst. Scientifico Tecnico Ernesto Breda, Sesto, San Giovanni, Italy.
A NEW PROCESS FOR DIRECT REDUCTION OF IRON PYRITES, A. Scortecci and M. Scortecci, Finsider Metallurgical Inst., Genoa, Italy.
OPERATION OF A BURNER-TYPE OPEN HEARTH, Iwao Murata, Chief of Steel Dept., Muroran Works, Fuji Iron and Steel Co., Ltd., Japan.
ANTI-CORROSIVE TREATMENTS FOR MAGNESIUM, Tukasa Kawamura, Asst. Ch. of Mfg., Dept. of Nikko Copper Works, Furakawa Electric Co., Nikko, Japan.
WELDING AUSTENITIC STEELS FOR HIGH-PRESSURE BOILER PLANTS, Egon Kauhausen, Ch. Metallurgist, Welding Laboratory, Bohler Bros. Edelstahlwerk, Dusseldorf, Germany.
SEASON CRACKING OF MANGANESE BRASS PROPELLERS, Yoshio Kaneda, The Hiroshima Shipyard and Engine Wks., West Japan Heavy Industries, Ltd., Hiroshima, Japan.
COCKERILL COMPANY'S EXPERIENCE WITH THE PERRIN PROCESS, J. Janvier, M. Nepper and J. Levaux, John Cockerill S.A., Seraing, Belgium.
A COMPARISON BETWEEN FE-CR-AL AND NI-CR ALLOYS FOR HIGH TEMPERATURE SERVICE, Gosta Hildebrand, Dir. of Research, Kanthal Inc., Hallstahammer, Sweden.
SHORT CYCLE ANNEALING OF WHITEHEART MALLEABLE CASTINGS, P. F. Hancock, Ch. Metallurgist, Birlec Ltd., Birmingham, England.
IMPROVED ALUMINUM-TIN ALLOYS AS POSSIBLE BEARING MATERIALS, H. K. Hardy, E. A. G. Liddiard, Fulmer Research Institute, and J. Y. Higgs and J. W. Cuthbertson, Tin Research Institute, England.
THE INFLUENCE OF DIFFERENT SURFACE COATINGS ON THE FATIGUE STRENGTH OF STEEL, Otto Forsman and Evert Lundin, Government Testing Institute, Stockholm, Sweden
SOME FACTORS AFFECTING THE WEAR OF BRONZE, S. G. Daniel and R. Graham, Thornton Research Center, Shell Refining and Marketing Co., Ltd., Chester, England.
EXPERIMENTAL PRODUCTION OF MAGNETIC (SENDUST) POWDER CORES, E. G. Thurlby, Superintending Metallurgist, Defense Research Labs., Melbourne, Australia.
THE COMMERCIAL DEVELOPMENT OF THREE GERMAN WROUGHT ZINC ALLOYS, Jacob Schramm, Ch. Metallurgist, Casting Shop and Extrusion Shop, Heinrich Diehl, Inc., Stuttgart, Germany.
THE EFFECT OF SMALL ALUMINUM ADDITIONS ON ALLOY STEEL, Mario Signora, Dir. of Research and Control Dept., Acciaierie e Ferriere Lombarde Falck, Milan, Italy.
THE CAUSE OF CHECK MARKS ON COPPER WIRE, B. I. Strom and B. G. Waller, AB Svenska Metallverken, Vasteras, Sweden.
FLAME RADIATION, G. M. Ribaud, Dir. of Study and Research on Gas, and Prof., University of Paris, France; J. E. deGraaf, Head, Labs. and Research, Royal Netherlands Iron and Steel Works, Ijmuiden, Netherlands; O. A. Saunders, Prof. Mechanical Engrg., Imperial College, Univ. of London, England; M. W. Thring, Head, Physics Dept., British Iron and Steel Research Assoc., London, England.
TWO POWDER METALLURGICAL METHODS TO PREPARE ALLOY SPECIMENS ON A LABORATORY SCALE, Jacob Schramm, Ch. Metallurgist, Casting Shop and Extrusion Shop, Heinrich Diehl, Inc., Stuttgart, Germany.
THE USE OF COMBUSTION MODELS IN OPEN-HEARTH FURNACE STUDIES, A. H. Leckie, Head, Steelmaking Div., British Iron and Steel Research Assoc., London, England.
MECHANICAL PROPERTIES OF SPRING STEEL, T. Mitsuhasi, M. Ueno, R. Nakagawa, and K. Tsuya, Govt. Mechanical Lab., Tokyo, Japan.
JAPANESE SUBSTITUTION STEELS IN THE LAST WAR, Seiji Nishikiori, Managing Dir. and Ch. Engr., Shin-Daido Steel Mfg. Co., Ltd.
RECENT DEVELOPMENTS IN THE METALLURGY OF ALUMINUM PISTON ALLOYS WITH HYPEREUTECTIC SILICON CONTENT, Emma Maria Onitsch-Modl, Privatdozent, University of Leoben, Austria.
MINERAL AND METAL INDUSTRIES OF INDIA, Dara P. Antia, British Aluminum Co. Ltd., New Delhi, India.
SMELTING KUJI IRON SAND BY THE KRUPP-RENN PROCESS, Kenji Kuwada, Exec. Dir. and Gen. Mgr., Fukiai Plant, Kawasaki Steel Corp., Kobe, Japan.
THE PLASTIC DEFORMATION OF ZINC BICRYSTALS, Tomoyoshi Kawada, Govt. Mechanical Lab., Ministry of International Trade and Industry, Tokyo, Japan.
A STATISTICAL ANALYSIS ON THE FORMATION OF CORNER CRACKS IN STEEL INGOTS, Adolfo Antonioli, Head, Control Dept., Societa Italiana Ernesto Breda, Milan, Italy.
EFFECT OF HYDROGEN ON THE DEFORMATION AND FRACTURE OF IRON AND STEEL IN SIMPLE TENSION, Paul Bastien and Pierre Azou, Ecole Centrale des Arts-et-Manufactures, Paris, France.
REDUCIBILITY OF ZINCIFEROUS ORES, E. Frenay, Prof. of Nonferrous Metallurgy, University of Liege, Belgium.
THE CONTINUOUS THERMAL TREATMENTS OF ALUMINUM ALLOY STRIP, Marcel Lamourdedieu, Dir., Central Light Alloys Corp., Issoire, France.
BRIGHT CHROMIZING BY THE FRENCH ONERA PROCESS, Bernard Jousset, Pres. and Dir. Gen., Societe Parisienne de Cementation, Paris, France.
WELDING TOOL STEELS, Tore Noren, Elektriska Svetningsaktiebolaget, Goteborg, Sweden.
DEEP WELDING—A NEW METHOD OF OXYACETYLENE WELDING, R. Gunnert, Head, Welding Research Lab., Svenska Aktiebolaget Gasaccumulator (AGA), Stockholm, Sweden.
METALLOGRAPHIC TECHNIQUES AND APPLICATIONS OF THE ELECTROLYTIC POLISHING OF ZIRCONIUM, TITANIUM AND BERYLLIUM, P. A. Jacquet, Cons. Engr. for the Construction and Naval Arms, Paris, France.
DEEP DRAWING SHEET STEEL, E. M. H. Lips, Ch. Engr., N. V. Philips' Glowlampworks, Eindhoven, Holland, and F. J. H. Rolink, Metall. Engr., Van Doorne's Aanhangwagenfabrick N. V., Eindhoven, Holland.
BASIC ELECTRIC ARC STEEL VERSUS ACID OPEN HEARTH STEEL FOR ROLLER BEARINGS, Bengt Kjerrman, Aktiebolaget Svenska Kullagerfabriken (SKF), Goteborg, Sweden.
METALLURGICAL EDUCATION, RESEARCH AND DEVELOPMENT WORK IN NORWAY, A. B. Winterbottom, Dept. of Metallurgy, Norway's Inst. of Technology, Trondheim, Norway.
MODERNIZATION OF AN OLD DRAW-BENCH FOR COLD DRAWN BARS, Nils L. Gripenberg, Mgr., Heat Treatment and Finishing Dept., Imatra Steelworks, Imatra, Finland.

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A. S. M. Review of Current Metal Literature

An Annotated Survey of Engineering, Scientific and Industrial Journals and Books Here and Abroad, Received During the Past Month

Prepared in the Library of Battelle Memorial Institute, Columbus, Ohio

W. W. Howell, Technical Abstractor

Assisted by Janet Motyka, Maxine Runkle and Members of the Translation Group

A

GENERAL METALLURGICAL

58-A Prospects. *Modern Packaging,* v. 25, Jan. 1952, p. 75-83, 175-176.

Economic outlook for the raw materials of packaging. Includes paper, cellophane, metals, lumber, rubber, adhesives, waxes, and plastics. (A5)

59-A. Developments in the Iron and Steel Industry During 1951. I. E. Madsen. *Iron and Steel Engineer,* v. 29, Jan. 1952, p. 103-138.

(A general, ST)

60-A. Industrial Wastes. Harold R. Murdock. *Industrial and Engineering Chemistry,* v. 44, Jan. 1952, p. 105A-106A, 108A.

Deleterious effects of Cu and Cr wastes to biological sewage-disposal methods. Considers especially problems encountered along the Naugatuck River in Connecticut. (A8, Cu, Cr)

61-A. Atmospheric Pollution. Louis C. McCabe. *Industrial and Engineering Chemistry,* v. 44, Jan. 1952, p. 113A-114A, 116A.

Efforts being made by Los Angeles nonferrous industries to reduce lead emissions in order to protect employees and improve air hygiene. Refers especially to Pb reclamation and Pb alloy foundries. Recovery equipment is diagrammed; electron micrographs show structure of fume particles. (A7, Pb)

62-A. Alternate Steels to Conserve Critical Alloying Elements. Alexander H. d'Arcambal. *Machinery* (American), v. 58, Jan. 1952, p. 189-190. (A condensation).

A survey, with emphasis on effects of boron. (A general, AY)

63-A. Secrecy in Nuclear Engineering. J. G. Beckerley. *Nucleonics,* v. 10, Jan. 1952, p. 36-38.

Questions whether we can effectively compete in the world atomic race unless we let down the barriers of secrecy. This problem is considered specifically as applied to raw materials, ore concentration and beneficiation, feed materials, production of fissionable materials, and production of atomic weapons. (A6, B general)

64-A. The Research Laboratories of Associated Electrical Industries Ltd. Arthur Fleming, B. G. Churcher, and L. J. Davies. *Proceedings of the Royal Society,* ser. A, v. 210, Dec. 20, 1951, p. 145-172.

British laboratories, which are engaged not only in practical electrical and electronic problems, but also in such fields as mechanical engineering, metallurgy and metalworking, physics, chemistry, etc. (A9)

65-A. Incorporation of Dust Control in Foundry Planning. J. Hunter. *British Cast Iron Research Association Journal of Research and Development,* v. 4, Dec. 1951, p. 152-156; disc., p. 156-161.

The difficulties of controlling heavy concentrations of dust and fume in the jobbing foundry. In larger jobbing foundries, dust and fumes can be alleviated by introducing one common knock-out point and by installing a simple sand reconditioning plant incorporating dust control. The question of slag and sand disposal, and the fettling shop and the core shop. (A7, E general)

66-A. 1951 Exceeds All Previous Years in Iron and Steel Production. Walter S. Tower. *Blast Furnace and Steel Plant,* v. 40, Jan. 1952, p. 47-48.

Briefly surveyed. (A4, Fe, ST)

67-A. Consumption of Scrap at a Record in 1951. Edwin C. Barringer. *Blast Furnace and Steel Plant,* v. 40, Jan. 1952, p. 49-50.

Statistical survey dealing only with ferrous scrap. (A4, Fe, ST)

68-A. The British Iron and Steel Industry in 1951. *Engineer,* v. 193, Jan. 4, 1952, p. 15-18; Jan. 11, 1952, p. 66-67. (A4, ST)

69-A. Metallurgical Research and Development in 1951. *Engineer,* v. 192, Jan. 18, 1952, p. 91-93.

Includes data on steels and alloys for gas turbines, low-temperature properties of metals, advances in the metallurgy of rarer metals, corrosion studies and metal resources and economics. (A general)

70-A. Review of Materials Engineering Developments in 1951. T. C. Du Mond. *Materials & Methods,* v. 35, Jan. 1952, p. 103-114.

A round-up of the major developments in: iron and steels, nonferrous metals, nonmetallic materials, fabricated parts and forms, finishes and coatings, heat treating, cleaning and finishing, and welding and joining. (A general)

71-A. Metallurgical Treatment of Swarf. E. R. Thews. *Metal Industry,* v. 79, Dec. 21, 1951, p. 521-524; Dec. 28, 1951, p. 535-538; v. 80, Jan. 4, 1952, p. 7-8, 10.

Methods of handling and storing, preliminary treatment, and subsequent metallurgical treatment. (A8)

72-A. Method of Recovery From Flue Dusts: Germanium and Gallium. F. M. Lever. *Metal Industry,* v. 80, Jan. 4, 1952, p. 3-4.

Includes flow sheet of the process used for the recovery of Ge and Ga from producer gas-flue dusts. (A8, Ge, Ga)

The coding symbols at the end of the abstracts refer to the ASM-SLA Metallurgical Literature Classification. For details write to the American Society for Metals, 7301 Euclid Ave., Cleveland 3, Ohio.

73-A. Pure and Applied Science in American Metallurgy. Cyril Stanley Smith. *Metal Progress,* v. 61, Jan. 1952, p. 51-54.

Stresses the benefits to be derived by the metallurgist by knowledge in other fields: i.e., physics, chemistry, etc. (A3)

74-A. Aluminum for Defense and Prosperity. Dewey Anderson. *Modern Metals,* v. 7, Jan. 1952, 43-46; disc., p. 46.

This country has about reached its limit in the expansion of economic aluminum production, so the best way to foster competition and growth is to open the door to greatly increased quantities of Canadian aluminum—in other words, encourage Alcan to complete its vast Kitimat smelter as soon as possible. Includes editor's commentary. (A4, Al)

75-A. More Scrap, More Tin; Detinning Produces Both. *Steel,* v. 130, Jan. 28, 1952, p. 70-72, 74.

Process at Weirton Steel to conserve Sn and recover scrap which formerly could not be used in open-hearth operations because of the presence of tin. (A8, Sn, ST)

76-A. The World Lead Situation. F. L. Hallam. *Western Miner,* v. 25, Jan. 1952, p. 35-38. (A4, Pb)

77-A. Metal Economics. II. Scrap Reclamation, Secondary Metals, and Substitute Metals. *Journal of the Institute of Metals,* v. 80, Jan. 1952, p. 240-252; disc., p. 252-254.

"The Scope for Conservation of Metals, Ferrous and Non-Ferrous," C. A. Bristow, A. J. Sidery and H. Sutton; "Economy by Standardization of Alloys and of the Method of Reclamation of Scrap Metals," C. Dinsdale; "The Influence of Specifications on Productivity and the Economic Utilization of Ferrous and Non-Ferrous Metals," F. Hudson; "Secondary Heavy Metals," E. H. Jones; "Secondary Aluminium and Magnesium," W. C. Devereux. (A8)

78-A. Modern Innovations and Progress in the Iron and Steel Industry. (In Spanish.) Georg Bulle. *Instituto del Hierro y del Acero,* v. 4, Jan.-Mar. 1951, p. 1-10.

Prior preparation of raw materials, production of cast iron and pig iron, transformations of iron and steel, improvement of quality, and scientific organization of working operations. Photographs and table. (A general, Fe, ST)

79-A. Industrial Research in the United States. (In Spanish.) Fred A. Morral. *Instituto del Hierro y del Acero,* v. 4, Jan.-Mar. 1951, p. 11-16.

Brief review of the amount and kinds of private and government industrial research presently being carried on in the U. S. Data are tabulated. (A9)

80-A. Raising Our Capacity to Produce. Metals Loosen The Logjam. *Engineering News-Record,* v. 148, Feb. 14, 1952, p. 77-79.

General status of the metal industry. (A4)

81-A. Safety Precautions for Special Work. H. Allen. *Foundry Trade Journal,* v. 92, Jan. 24, 1952, p. 93-94.

As applied in foundry practice. (A7, E general)

82-A. Copper-Base Non-Ferrous Ingots. W. G. Mochrie. *Foundry Trade Journal,* v. 92, Jan. 31, 1952, p. 121-124.

Classification of various types. Chart shows possibilities of mistaken identity in normal sorting techniques for Cu-base alloys, applied in connection with scrap recovery. (A8, S10, Cu)

83-A. An Economic Study of Fuels in Manufacturing. Walter H. Voskuil. *Illinois State Geological Survey,* Report of Investigations 157, 1951, 28 pages.

Data on the amount and kind of each fuel used per employee, by industries or industry groups; the role of electric power; the quantities used by workers; changes since 1939; comparative fuel costs; and the competitive trend among fuels. Emphasizes fuels and power in the iron and steel industries. (A4, B18, Fe, ST)

84-A. Recovery of Chromic Acid From Plating Operations. F. R. Keller and R. E. Shaw. *Plating,* v. 39, Feb. 1952, p. 152-154.

The recovery system at the Standard Steel Spring Co., Newton Falls, Ohio. Diagrams. (A8, L17)

85-A. Waste Pickle Liquor Treatment and Disposal. I. Problem of Waste Pickling Liquor Disposal. Thomas F. Reed. **II. Waste Pickle Liquor Treatment by Armco Steel Corporation at Butler, Pa.** Grant A. Pettit. **III. Waste Pickle Liquor Disposal by Walker of Conshohocken.** W. A. Cubberley and C. J. Lewis. **IV. Central Treatment Plant for Waste Pickle Liquor.** John H. Harper. *Sewage and Industrial Wastes,* v. 24, Jan. 1952, p. 66-82. (A8, L12)

86-A. Interrelationship of Air Pollution and Water Pollution. Louis C. McCabe. **Discussion.** M. Allen Pond, and E. Neil Helmers. *Sewage and Industrial Wastes,* v. 24, 1952, p. 83-91.

Emphasis is on the mineral industry. (A7)

87-A. (Book) **Capital Development in Steel; A Study of the United Steel Companies Ltd.** P. W. S. Andrews and Elizabeth Brunner. 374 pages. 1951. Basil Blackwell, Oxford, England.

Detailed information on production techniques and processes, industrial environment and development, managerial reorganization and financial reconstruction, and capital development from the thirties through 1950. The theory of investment decisions is stressed. (A4, ST)

88-A. (Book) **Man and the Chemical Elements** (From Stone-Age Hearth to the Cyclotron). J. Newton Friend. 354 pages. 1951. Charles Griffin & Co. Ltd., 42 Drury Lane, London, W.C. 2, England. 27S, 6d.

A book to browse in. Especially is it a fascinating collection of citations in literature to the metals known in ancient and medieval times. A clear account is given of the discovery of each of the elements which have been isolated since the age of alchemy. Outlines of the development of knowledge and the commercial uses of each element are written as only they could be by a man of great breadth of chemical and physico-chemical information. To compress it all in 354 pages the treatment must be sketchy, and the information about the score of metallic elements widely used in civilized countries lacks scope and timeliness—but after all, one consults this book not for today's developments but to find out what our ancestors thought was important enough to record. E.E.T. (A2)

89-A. (Book) **Manufacturing Equipment and Processes.** Charles W. Lytle and Arthur F. Gould. 759 pages. 1951. International Textbook Co., Scranton, Pa.

As applied to the metallurgical industries. Chapter references. (A general)

90-A. (Book) **Productivity Report on Wrought Nonferrous Metals Industry by the British Nonferrous Metals Productivity Team.** Anglo-American Council on Productivity, 2 Park Ave., New York. 75c.

A summary of recommendations for British manufacturers based on visits to American brass mills by a "productivity" team. (A4, F general, Cu)

91-A. (Book) **A Technical Survey of the Abbey.** Margam, Trostre and Newport Plants of the Steel Co. of Wales, Ltd. Numerous authors. 262 pages, 1951. Industrial Newspapers, Ltd., 49 Wellington St., London W.C. 2, England.

A complete account of the design and construction of new sheet and tin-plate mills and associated blast furnaces, openhearths and auxiliaries at Port Talbot, Wales. The plans represented far more than the modernization of an existing plant; they represented no less than a revolution in the steel industry of South Wales. Various chapters, written by members of the company's technical staff, the consulting engineers, the contractors and equipment manufacturers, describe and illustrate all phases of this project with total annual capacity of 2,000,000 tons—big in anybody's economy. (A5, ST)

92-A. (Book) **3100 Needed Inventions.** Raymond F. Yates. 336 pages. 1951. Wilfred Funk, Inc., New York.

Stresses the need for inventors with analytical minds able to improve the ordinary equipment we come in contact with in our everyday lives. Includes metallurgical problems. (A general)

93-A. (Book) **Waste Trade Directory of Dealers and Consumers in the United States and Canada.** 990 pages. 1951. Atlas Publishing Co., 425 W. 25th St., New York 1, N. Y.

Lists dealers in textile equipment, rubber machinery, scrap metals, auto wreckers, secondhand bags and bagging, paper mills, etc. Arranged by states and cities under broad headings. (A8)

94-A. (Book) **Metallurgische Verarbeitung von Altmetallen und Rueckstaenden. (Band II.)** (Metallurgical Treatment of Scrap Metals and Wastes. Vol. II.) Edmund R. Thews. 290 pages. Carl Hanser Verlag, Munich 27, Germany. 31.50 DM.

Deals with Cu and Cu-base alloys. Sorting of the metals and general treatment procedures. Methods of handling Cu scrap, brasses and bronzes. Gas content and porosity; deoxidation; use of various types of melting units; screening of chips; stripping of lead-covered cable; the occupational diseases of lead poisoning and zinc fever. (A8, Cu)

B

RAW MATERIALS AND ORE PREPARATION

63-B. Size Reduction. Lincoln T. Work. *Industrial and Engineering Chemistry,* v. 44, Jan. 1952, p. 91-94.

Annual review. 73 ref. (B13)

64-B. Ore Companies Look Ahead to Ample Supplies. *Business Week,* Jan. 26, 1952, p. 124-127.

Future sources of iron ore. Improved techniques in the use of this ore. (B10, Fe)

65-B. Processes For Recovering Vanadium From Western Phosphates. Lloyd H. Banning and R. T. C. Rasmussen. *U. S. Bureau of Mines,* Report of Investigations 4822, Dec. 1951, 44 pages.

33 references. (B general, V)

66-B. Beneficiation of Ores by Nuclear Methods. Antoine M. Gaudin, Frank E. Senftle, and Wilfred L. Freyberger. *Technology Review,* v. 54, Jan. 1952, p. 143-144.

How artificially induced radioactivity is being investigated as a means of mineral separation. (B14)

67-B. Canada's Iron Ore Resources; Exploration and Development of the Quebec and Labrador Deposits. J. A. Retty. *Times Review of Industry,* v. 6, Jan. 1952, p. 68, 71. (B10, Fe)

68-B. U. S. A. Exploits Low Grade Iron Ore. R. H. Warring. *British Steelmaker,* v. 13, Jan. 1952, p. 19-21.

Pelletizing procedures at Beaver Bay, Minn., plant now being constructed. (B16, Fe)

69-B. The Minerals and Metals in Coal. J. L. P. Wyndham. *South African Mining and Engineering Journal,* v. 62, Dec. 15, 1951, p. 659, 661.

Possibilities of utilization. The vitranized portion of the coal matrix contains Ge, V, Mo, Ga, and other elements. Minor constituents take the form of P, As, Cl, and S. (B10)

70-B. Notes on Tin and Mercury. R. O. Forsyth-King. *South African Mining and Engineering Journal,* v. 62, pt. 2, Dec. 22, 1951, p. 711, 713.

Economic prospects of greater Pb supplies from South Africa and of increased production of Hg. (B10, Pb, Hg)

71-B. Drying of Ironstone. R. C. Walthew. *Ceramics,* v. 3, Dec. 1951, p. 513-518.

Process developed for drying iron ores used by a British firm. Data are tabulated. (B15, Fe)

72-B. High Speed Heating: Its Fundamentals and Applications in Industry. Paul A. Furkert. *Industrial Gas,* v. 30, Jan. 1952, p. 11-13, 25-28.

Comparatively new art, with emphasis on localized flame heating and high-head radiant heating, proves highly useful in metallic heating, curing of finishes, cloth singeing, and ink drying. (B18)

73-B. The Extraction and Refining of Germanium and Gallium. A. R. Powell, F. M. Lever, and R. E. Walpole. *Journal of Applied Chemistry,* v. 1, Dec. 1951, p. 541-551.

Sources of Ge and Ga and processes for recovery of these elements from flue dusts and from germanite. (B10, B14, A8, Ge, Ga)

74-B. Metal Economics. I. Primary Resources of Ferrous and Non-Ferrous Metals. *Journal of the Institute of Metals,* v. 80, Jan. 1952, p. 225-237; disc., p. 237-239.

After an introduction by A. J. Murphy, the following papers were presented: "The World Supply of Non-Ferrous Metals, Including the Light Metals," R. Lewis Stubbs; "Metals as Natural Resources," S. Zuckerman; and "World Demand and Resources of Iron Ore," T. P. Colclough. (B10, A4)

75-B. Sintering Iron Ore in England. *Metal Progress,* v. 61, Jan. 1952, p. 107-108, 110, 112. ((Condensed from "Investigation of the Effects of Controlled Variables on Sinter Quality," E. W. Voice, C. Lang, and P. K. Gledhill.)

Previously abstracted from *Journal of the Iron and Steel Institute.* See items 146-B and 147-B, 1951. (B16, Fe)

76-B. Blast Furnace Sinter. *Metal Progress,* v. 61, Jan. 1952, p. 112, 114, 116. (Condensed from "Improving Current Practice in Blast Furnace Sintering," Robert E. Powers.)

Previously abstracted from *American Iron and Steel Institute.* Preprint. 1951. See item 138-B, 1951. (B16, Fe)

77-B. Sinter and Sponge Iron in Swedish Practice. *Metal Progress,* v. 61, Jan. 1952, p. 118, 120, 122. (Condensed from "Sweden's Iron and Steel Industry," T. L. Joseph.)

Previously abstracted from *Journal of Metals.* See item 186-B, 1951. (B general, D general, Fe)

78-B. Manganese Extraction by Carbamate Solutions and the Chemistry of New Manganese-Ammonia Complexes. Reginald S. Dean. *Mining Engineering,* v. 4, Jan. 1952; *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 193, 1952, p. 55-60.

The widespread occurrence of Mn in low-grade oxide and carbonate ores not amenable to mechanical concentration has led to extensive investigations of hydrometallurgical methods for producing a pure Mn compound suitable for further treatment. Describes a process based on use of a new group of aqueous Mn-NH_3 complex solution, which permits rapid solution of MnO to concentration of 80-100 g. Mn per l. and from which a fully crystalline, easily filtrable $MnCO_3$ is precipitated by the addition of CO_2 and partial NH_3 removal. This process was tested extensively on a wide variety of ores, and good extraction and recovery was obtained. Phase diagrams and tabulated data. 10 ref. (B14, Mn)

79-B. Frothing Characteristics of Pine Oils In Flotation. Shiou-Chuan Sun. *Mining Engineering,* v. 4, Jan. 1952; *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 193, 1952, p. 65-71.

Design and operation of a frothmeter capable of measuring the frothing characteristics of pine oils and other frothing reagents. Factors affecting the frothability of pine oil. Results show that relative frothabilities of pine oils in the frothmeter generally correlate with those in actual flotation, provided that other factors are kept constant. In addition to pine oils, other well-established flotation frothers were tested. Data are charted and tabulated; apparatus is diagrammed. 12 ref. (B14)

80-B. Manganese—Vital Cog in National Defense. John A. Wood. *New Mexico Miner,* v. 14, Jan. 1952, p. 5, 16-17.

Its importance, foreign and domestic sources and suggestions for increasing domestic production. (B10, Mn)

81-B. On the Emulsification of the Flotation Reagents By Means of Ultrasonic Waves. (In English.) Tadashi Oyama and Sakae Tanaka. *Science Reports of the Research Institutes, Tohoku University,* Ser. A, v. 2, Dec. 1950, p. 925-927.

Concludes that time required can be reduced so that efficiency of flotation is increased; recovery of the ore can be increased; and high selectivity for differential flotation will be expected with lower consumption of the flotation reagents. (B14)

82-B. Cobalt From Roasted Pyrites. (In German.) K. Horalek. *Angewandte Chemie,* v. 63, Nov. 21, 1951, p. 525-527.

Procedure of extracting the Co from iron ore. Data, charted and tabulated, show that Co production varies greatly with time and country and that the Co content of iron ores varies greatly with source. 10 ref. (B15, Co)

83-B. Laboratory and Plant Results With Hydrocyclones. (In German.) C. Krijgsman. *Chemie-Ingenieur-Technik,* v. 23, Nov. 28, 1951, p. 540-542.

Includes discussion on use of hydrocyclonic separators as washing devices in ore beneficiation plants. Diagrams, graphs, and tables. (B14)

84-B. Our Iron and Steel Problem. (In Spanish.) Ricardo Guevara Lizaur. *Instituto del Hierro y del Acero,* v. 4, Jan.-Mar. 1951, p. 24-38; Apr.-June 1951, p. 98-111.

Various production and consumption problems of the Spanish iron and steel industry. Part 1: Raw materials; Part 2: Manufacturing problems. Photographs and tables. (B10, D general, Fe, ST)

85-B. Refractory Linings for Reheating Furnaces. (In Spanish.) V. Letort. *Instituto del Hierro y del Acero,* v. 3, Oct.-Dec. 1950, p. 334-336. (Translated from *Comptes Rendus des Journées de la Grosse Forge.*)

Problems concerning linings for different types of furnaces. (B19)

86-B. Comparative Laboratory Tests With Jaw Crushers. (In Swedish.) Sture Mörtsell. *Jernkontorets Annaler,* v. 135, no. 9, 1951, p. 529-552.

Comparative crushing tests in a Dodge laboratory crusher and in a full-scale Blake jaw crusher were made with a number of different materials with varying characteristics. In some cases the comparison was extended to include tests on a single-toggle crusher. Method of testing. (B13)

87-B. The Utilization of Low Grade Domestic Chromite. K. W. Downs and D. W. Morgan. *Canada Department of Mines and Technical Surveys,* Memorandum Series 116, Oct. 1951, 54 pages.

Canadian and North American reserves of chromite ores, their quality, and possible uses (metallic and nonmetallic), and methods suggested for their beneficiation. Production of the metal from the concentrates by various methods. Numerous tables and graphs. (B10, B14, C general, Cr)

88-B. Vanadium Recovery From Chromate Liquors. T. S. Perrin, J. N. Jenkins, and R. G. Banner. *Industrial and Engineering Chemistry,* v. 44, Feb. 1952, p. 401-404.

Data are tabulated. (B14, A8, V)

89-B. Production of a Hafnium Concentrate by Adsorption. Gerhard H. Beyer, Alfred Jacobs, and Richard D. Masteller. *Journal of the American Chemical Society,* v. 74, Feb. 5, 1952, p. 825-827.

A process was developed for concentrating Hf from a naturally occurring feed material containing 2% hafnium oxide (based on Hf and Zr content) to approximately 90% hafnium oxide in two cycles, involving adsorption and differential stripping with mineral acids at room temperature. Approximately 70% of the original Hf adsorbed can be recovered as high-Hf concentrate. (B14, Hf)

90-B. Mining Geology. Olaf N. Rove. *Mining Engineering,* v. 4, Feb. 1952, p. 140-143.

Recently discovered sources of various minerals. (B10)

91-B. Cheaper and Improved Methods of Beneficiating Lower Grade Ores Was Target in 1951. Raymond E. Byler. *Mining Engineering,* v. 4, Feb. 1952, p. 149-155.

Grinding, screening, and materials handling techniques. Improved methods and machines. (B13)

92-B. Adsorption on Quartz, From an Aqueous Solution, of Barium and Laurate Ions. A. M. Gaudin and C. S. Chang. *Mining Engineering,* v. 4, Feb. 1952; *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 193, 1952, p. 193-201.

Adsorption was measured for barium ion and laurate radical, using radioactive tracers, over a wide range of concentrations. Laurate adsorbed in absence of barium fails to float. With barium, flotation-effective laurate coatings need not exceed 5% of a monolayer. 21 ref. (B14)

93-B. Investigation of Kasna Creek Copper Prospect, Lake Kontrashibuna, Lake Clark Region, Alaska. *U. S. Bureau of Mines,* Report of Investigations 4828, 10 pages, Dec. 1951. (TN21 Un3r)

The ore-dressing tests made on the samples included gravity concentration with a spiral, magnetic separation, and flotation. (B14, Cu)

94-B. Beneficiation of High-Iron Arkansas Bauxite Ore. W. A. Calhoun, H. E. Powell, and J. F. Hodshire. *U. S. Bureau of Mines,* Report of Investigations 4841, Jan. 1952, 12 pages.

In the laboratory investigation of four high-Fe bauxite samples, a concentration method was developed whereby all of the Al_2O_3 contained could be recovered as abrasive-grade and metal-grade bauxite. The procedure consists of a short (10-15-min.), low-temperature (400-450° C.) oxidizing roast, followed by high-intensity magnetic separation. Subsequent grinding of the magnetic reject to −65 mesh, followed by low-intensity wet magnetic separation gives an improved metal-grade bauxite and an Fe concentrate of potential value. Data are tabulated. (B14, Al, Fe)

95-B. Concentration of Oxide Manganese Ores From Black Rock, Kramer, and Morgan-Cromar Properties, Tooele and Juab Counties, Utah. J. V. Batty and R. Havens. *U. S. Bureau of Mines,* Report of Investigations 4818, Jan. 1952, 17 pages.

Investigation showed that Morgan-Cromar ores are amenable to concentration by ore-dressing methods, although high recoveries were prevented by the intimate Mn-Si association. Data are tabulated. (B14, Mn)

96-B. Concentration of Oxide Manganese Ore From Doyle-Smith Claims, Northern Yuma County, Ariz. A. O. Ipsen and H. L. Gibbs. *U. S. Bureau of Mines,* Report of Investigations, 4844, Jan. 1952, 6 pages.

Methods used. Results are tabulated. (B14, Mn)

C

NONFERROUS EXTRACTION AND REFINING

25-C. The Production of Pure Cerium Metal by Electrolytic and Thermal Reduction Processes. P. M. J. Gray. *Bulletin of the Institution of Mining and Metallurgy,* Jan. 1952; *Transactions,* v. 61, pt. 4, 1951-52, p. 141-170.

Production of pure Ce by electrolytic reduction of its fused trichloride and its dioxide dissolved in a bath of fused fluorides and thermal reduction of the trichloride and trifluoride. Graphs and tables. 36 ref. (C23, C21, Ce)

26-C. High Vacuum Melting. *Canadian Metals,* v. 15, Jan. 1952, p. 31.

A furnace that produces high-grade alloy melts in a gas-free chamber. Diagram. (C5, D9)

27-C. Revere Installs Large Water-Cooled Mold. *Iron Age,* v. 169, Jan. 24, 1952, p. 68.

Special feature is the honeycomb-shaped compartments for cooling water. Designed for casting brass ingots up to 10,000 lbs. in weight. (C5, Cu)

28-C. Mechanism of the Reduction of Oxides and Sulphides to Metals. Carl Wagner. *Journal of Metals,* v. 4, Feb. 1952; *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 194, 1952, p. 214-216.

Migration of metal over distances of several mm. was observed in the following reactions: reduction of silver sulfide by Cu; reduction of cuprous sulfide by Fe; and reduction of cuprous sulfide by cuprous oxide. (C21, P12, Ag, Cu)

29-C. Ductile Titanium. *Metal Industry,* v. 80, Jan. 11, 1952, p. 29-30.

Production methods. Flow sheet of the process used for converting $TiCl_4$ into powdered metallic Ti. (C4, Ti)

30-C. Pure Cerium Metal. P. M. J. Gray. *Metal Industry,* v. 80, Jan. 18, 1952, p. 43-46. (Condensed from *Bulletin of the Institution of Mining and Metallurgy.)*

See abstract of original from above. *Transactions,* item 25-C, 1952. (C23, C21, Ce)

31-C. Researches on Nickel Matte. C. C. Downie. *Mining Journal,* v. 238, Jan. 4, 1952, p. 12-13.

Modification of smelting, converting, and matte refining procedure developed for application to ores containing a considerable amount of copper. An adaptation of the oxalic acid process and an electrorefining process are discussed. (C21, C23, Ni)

32-C. Olivine As a Source of Magnesium. Norman Ketzlach and R. W. Moulton. *Trend in Engineering at the University of Washington,* v. 4, Jan. 1952, p. 21-24. (Condensed from thesis.)

Olivine may be leached with HCl and NH_4Cl or $CaCl_2$ and acid to give a solution containing a much higher percent Mg than found in olivine ore. Using CaC_2 as reducing agent, yield was found to increase with increase in time, temperature, and fineness of the charge. 10 ref. (C26, B14, Mg)

33-C. Contribution to Knowledge Concerning Aluminum Electrometallurgy. (In French.) *Journal du Four Electrique et des Industries Electrochimiques,* v. 60, Nov.-Dec. 1951, p. 143-144.

A brief study of the equilibria of cryolite-alumina melts. Includes graphs. (C23, Al)

34-C. Technology of Magnesium Production. (In German.) W. Moschel. *Angewandte Chemie,* v. 63, Sept. 21, 1951, p. 385-395.

Reviews present status of electrolytic and thermal production of Mg in Germany and the U. S. The most successful electrolytic methods economically are shown to differ in choice of raw material, preparation of charge, and design of electrolytic cell. Includes illustrations, graphs, and tabulated data. 78 ref. (C21, C23, Mg)

35-C. Gold Refining With Ripple Current From Rectifiers. (In German.) Julius Steiner. *Zeitschrift für Elektrochemie und angewandte physikalische Chemie,* v. 55, Dec. 1951, p. 690-695.

Rectified single-phase a.c. in a half-wave circuit has the same effect as a ripple current produced by superposition of a.c. and d.c. An attempt is made to express, by simple formulas, the electrolytic effects of the ripple-current curve. Tables, graphs, diagrams, and photomicrographs. (C23, Au)

36-C. Ingot Manufacture. W. G. Mochrie. *Metal Industry,* v. 80, Jan. 25, 1952, p. 63-66.

Economic factors, competition with other industries, varying refining methods, plant, and practice for nonferrous ingots. Particular attention is devoted to scrap-metal segregation. (C general, A8, EG-a)

D

FERROUS REDUCTION AND REFINING

61-D. Melting Low Carbon Stainless Steel. Walter Crafts and H. P. Rassbach. *Journal of Metals,* v. 4, Jan. 1952, p. 20-25.

Slag and metal relationships for oxidation, reduction, and addition steps in electric-furnace melting very low carbon heats. Conclusions. (D5, SS)

62-D. Discussion of the Axial Compressor for Blast Furnace Blowing. *Iron and Steel Engineer,* v. 29, Jan. 1952, p. 79-84.

Covers paper by W. O. Lowell (Oct. 1951 issue; see item 363-D, 1951). (D1, Fe)

63-D. Comparative Economics of the Electric Furnace and Open Hearth. H. W. McQuaid. *Iron and Steel Engineer,* v. 29, Jan. 1952, p. 85-93; disc., 93-95.

An investigation of the economic problems involved in the selection of steelmaking furnaces. (D2, D5, ST)

64-D. Porous Steel. *Business Week,* Jan. 19, 1952, p. 89-90.

Process developed by Ontario Research Foundation which turns out parts with any desired density from 92 to 453 lb. per cu. ft. Instead of pouring a molten metal into a mold, impurities like silica are first removed from the ore, leaving only pure iron oxide particles which are ground to a fine size. Then the ore is poured into porous molds, and ore and molds are placed in a ceramic crock, which is then filled with coke and limestone. The crock is put in a furnace and held at 2000° F. for several hours. Result is a part with a cellular structure. (D8, ST)

65-D. Accurate Methods for Computing Electric Furnace Heats. R. B. Shaw. *Steel,* v. 130, Jan. 21, 1952, p. 72, 74-75.

Ways and means of assisting the melter in making calculations in electric-furnace making of high-alloy or stainless steels. An example is worked out in complete detail. (D5, SS, AY)

66-D. The Development of the Small Bessemer Steel Plant From Its Beginning to the Present Day. (In German). H. Wolff. *Giesserei,* v. 38, Nov. 1, 1951, p. 565-572.

History of the small bessemer converter and other small converter types, such as Clapp-Griffith, Walrand-Delattre, Robert, Tropenas, and Zenzes. Efforts at basic steel production in small converters and the introduction of multiple processes. (D3, ST)

67-D. Should the Steel Industry Move Closer to Liquid Charging? John O. Griggs. *Blast Furnace and Steel Plant,* v. 40, Jan. 1952, p. 51-57.

Liquid charging system and its advantages. Advantages of the dry-bottom tilting furnace over the stationary furnace. Recommends top charging of openhearth furnaces. Schematic diagram shows design for top charging. Tables and graphs show world reserves of iron ore and coal, and coal-carbonization statistics. (D2, B10, ST)

68-D. High Top Pressure Operation or Burden Preparation. A Survey of Differences in Blast Furnace Practice in the United States and Britain. D. D. Howat. *Blast Furnace and Steel Plant,* v. 40, Jan. 1952, p. 71-76.

Includes tables and illustrations. (D1, ST)

69-D. Hot Topping Practice. W. T. Sergy. *Blast Furnace and Steel Plant,* v. 40, Jan. 1952, p. 89-90.

Practice at Jones & Laughlin Steel Corp. Use of the re-usable or permanent-type hot top makes it possible to reduce the volume of the sinkhead by approximately 3% on slab ingots. Diagrams. (D9, ST)

70-D. Transverse Ingot Cracks. Norman F. Dufty. *Blast Furnace and Steel Plant,* v. 40, Jan. 1952, p. 91-94, 130-131.

Causes are believed to be primarily in the steelmaking process, rather than in subsequent working operations. Effects of mold design, pouring practice, and steel composition and temperature. 11 ref. (D9, ST)

71-D. Oxygen as a Means of Increasing Bessemer Production. III. W. G. McDonough. *Industrial Heating,* v. 19, Jan. 1952, p. 71-72, 74, 76, 78, 80.

The general effect of the oxygenated blast on converter slags and bessemer steel quality. Blowing time, flame appearance, and converter bottoms and linings. Conclusions as to the use of O_2 in acid bessemer converters. (D3, ST)

72-D. Direct Reduction Yields Variable Density Steels. P. E. Cavanagh. *Iron Age,* v. 169, Jan. 24, 1952, p. 63-68.

A process for producing useful articles of carbon or alloy steel directly from iron ore. The main characteristics are low cost and a wide choice of weight and strength. Fine, prepared ore or mill scale is reduced with coke and limestone in a continuous kiln, yielding plain carbon or alloyed steel. Bars, slabs, pipe, and other shapes have been produced with densities of 1.0-7.2 g. per cc. Graphs and tables show physical and mechanical properties. (D8, P general, Q general, Fe, CN, AY)

73-D. A Survey of Zebra Roof Practice. C. E. Grigsby. *Journal of Metals,* v. 4, Feb. 1952, p. 132-139.

The zebra roof for openhearth furnaces comprises rings of either regular or super-duty silica brick, alternated with rings of basic brick in areas of greatest wear—along back or front skews, or both. (D2)

74-D. Principles of Zone-Melting. W. G. Pfann. *Journal of Metals,* v. 4, Feb. 1952, p. 151.

Solidification method known as zone-melting. A basic feature is the traversal of a relatively long charge of solid alloy by a short molten zone, and a basic consequence of which is a high degree of control of the distribution of solute in the ingot. (D9, C5, N12)

75-D. Behaviorism of Elements in Iron and Steel Making. Herbert W. Graham. *Metal Progress,* v. 61, Jan. 1952, p. 87-96.

The present iron ore situation. Classifies the chemical elements in the raw materials as to their behavior in conventional iron and steelmaking processes by assembling data on oxide stability combined with a summation of empirical experience. Graphs and tables show relation of behavior to location in the periodic system. (D general, B general, Fe, ST)

76-D. Openhearth Charge Ores. *Metal Progress,* v. 61, Jan. 1952, p. 152, 154, 156. (Condensed from paper by John J. Golden and Henry E. Warren.)

Previously abstracted from *American Iron and Steel Institute,* Preprint, 1951. See item 202-D, 1951. (D2, B22, Fe, ST)

77-D. Desulphurization Worth Watching. William W. Austin, Jr. *Steel,* v. 130, Jan. 28, 1952, p. 76, 78, 80-81.

Investigation shows that desulfurization efficiency in blast furnaces is low. Various ways for improving the process. (D1, Fe)

78-D. Coke Consumption Rate Determines Furnace Charges. *Steel,* v.

130, Feb. 4, 1952, p. 91-93. (Based on paper by R. V. Flint and J. J. Kulesz.)

Coke consumption in blast furnaces. (D1, Fe)

79-D. Fluid Flow in Relation to the Manufacture of Steel. M. P. Newby. "Some Aspects of Fluid Flow," 1951. (Edward Arnold & Co., London), p. 194-215.

Problems in fluid flow which arise in the various processes of the steel plant. Recent studies, especially that carried out by the British Iron and Steel Research Assn. Includes studies on the blast furnace, steel-making processes, oil metering, water cooling, melting-shop ventilation, casting and pouring, and soaking pits and reheating furnaces. 21 ref. (D general, ST)

80-D. Use of the Triplex Process in a Steel Foundry. (In French.) *Fonderie*, Dec. 1951, p. 2742-2746.

Process consists of using a cupola, a small acid converter, and a basic arc furnace for producing steel. Data are tabulated. (D7, ST)

81-D. The Burner Ports of Openhearth Furnaces Fired With Coke-Oven Gas. (In German.) Friedrich Wesemann and Wilhelm Schmitt. *Stahl und Eisen*, v. 71, Dec. 1951, p. 1413-1419; disc., p. 1419-1420.

Design considerations. Results of investigation of several furnaces with different gas-port dimensions and shape. Compares these with results of model experiments. (D2, ST)

82-D. Refractory Linings for Openhearth Furnaces. Comparative Factors Between Acid and Basic Linings. (In Italian.) A. Scortecci and F. Savioli. *Metallurgia Italiana*, v. 43, Dec. 1951, p. 521-525.

The three systems presently available: silica bricks with or without basic bricks for certain parts; quartzite tamped lining for everything except the arches; and all-basic linings. 23 ref. (D2, ST)

83-D. Production of Sponge Iron in a Tunnel-Type Furnace. (In Spanish.) Patrick E. Cavanagh. *Instituto del Hierro y del Acero*, v. 4, Apr.-June 1951, p. 93-97.

Investigations conducted at the Ontario Research Foundation in Canada. Data are tabulated and charted. (D8, Fe)

84-D. Rammed-Carbon Blast Furnace Hearths. Part II. (In Spanish.) Francisco Millan. *Instituto del Hierro y del Acero*, v. 3, Oct.-Dec. 1950, p. 282-287.

Economics of construction, and manufacture of the carbon bricks. Tables and diagrams. (D1, Fe)

85-D. Use of Oxygen and Carbon Dioxide Instead of Air in the Final Stage of the Basic Bessemer Process. (In Swedish.) Bo Kalling, Folke Johansson, and Lennart Lindskog. *Jernkontorets Annaler*, v. 135, No. 10, 1951, p. 557-572.

Results of a number of experimental blows in a 14-ton basic bessemer converter, in which the charges were dephosphorized with O_2/CO_2 instead of air. Nitrogen content was reduced to about 0.006% in the finished steel, as against about 0.012% by normal air blows. A further reduction to 0.003-0.004% was possible by using oxygenated air for the preliminary blowing. Equal parts of O_2 and CO_2 produced approximately the same temperature conditions as air-blowing but the blowing time was slightly shortened. There was no apparent increased injury to the converter bottom. Another advantage of final blowing with O_2/CO_2 is that pouring temperature can be adjusted to that most suitable for the mode of pouring and the quality of the steel. 20 ref. (D3, ST)

86-D. How Much Can Oxygen Do? *Business Week*, Feb. 2, 1952, p. 46, 48.

The role of oxygen in steelmaking. (D general, ST)

87-D. Direct Reduction Yields Variable Density Steels. Part II. P. E. Cavanagh. *Iron Age*, v. 169, Jan. 31, 1952, p. 108-111, 114.

How a pipe was made by rushing a mold through the kiln—and then dumping out unreduced ore in center. Hot-swaged bar (of mill scale) has same density and properties as steel of same analysis. One piece can have different chemistries and properties. (D8, CI)

88-D. Oxy-Natural Gas Hot-Top Heating Increases Ingot Yield. A. J. Texter and E. F. Kurzinski. *Iron Age*, v. 169, Feb. 14, 1952, p. 126-128.

The latest, and possibly the best answer, to the old problem of hot-top size is heating with oxy-natural gas. High-alloy and stainless steel ingots are now being poured using this standardized method with no bad effects on steel quality. The practice is simple and quick and no water cooling of burner is necessary. (D9, SS, AY)

89-D. Some Experiences in the Use of Chrome-Magnesite Refractories. G. Reginald Bashforth. *Metallurgia*, v. 45, Jan. 1952, p. 12-16.

The structure and constitution of the materials as related to performance in openhearth steelmaking. Micrographs. (D2)

90-D. Blast Furnace Practice. IV. Influence of Coke-Ash on Thermal Effects. V. Comparison of Operating Data. Charles E. Agnew. *Steel*, v. 130, Feb. 4, 1952, p. 98, 101-102, 104, 107, 110; Feb. 11, 1952, p. 97, 100, 102, 105, 108.

Thermal economy in smelting operations and relationship between constituents of tapping slag and % ash in coke. The method used for classifying slag by tetrahedrons. The four principal constituents of daily average slag analysis are first converted to the 100% composition, from which the tetrahedron for the day is determined by applying the analysis to the McCaffery diagram. Advantages of this method. (To be continued.) (D1, Fe)

E

FOUNDRY

128-E. Metallurgy of Shell Molding. B. N. Ames, S. B. Donner, and N. A. Kahn. *American Foundryman*, v. 21, Jan. 1952, p. 24-29.

Plastic-bonded shell molds have an insulating quality overlooked by many foundrymen. This factor, plus soundness, mechanical properties of shell cast metals, and other metallurgical factors studied at the New York Naval Shipyard. Effects of various factors on macrostructures and mechanical properties. Work was done on Al alloys, bronzes, gray cast iron, and cast steel. (E16, M28, Q general, Al, Cu, CI)

129-E. Side Risers Cut Cleaning Room Costs on Alloy Iron Castings. Roy Chamberlin. *American Foundryman*, v. 21, Jan. 1952, p. 33-36.

How side risering of special alloy iron cut cleaning room costs and produced sound castings when top risering failed. Numerous schematic diagrams. (E22, CI)

130-E. Basic Cupola Operation. John P. Holt. *American Foundryman*, v. 21, Jan. 1952, p. 39-43.

How to overcome difficulties involved in converting from acid to basic cupola operations. Advantages, applications, installation, operation, and maintenance. (E10, CI)

131-E. Modern Foundry Methods: Equipment and Layout for Small Foundry. *American Foundryman*, v. 21, Jan. 1952, p. 44-47.

Plant at Engineering Castings, Inc., Marshall, Mich.—a small alloy-iron foundry. (E general, CI)

132-E. Gray Iron Fluidity Variables; Effect of Composition and Pouring Temperature. Lew F. Porter and Philip C. Rosenthal. *American Foundryman*, v. 21, Jan. 1952, p. 53-59.

A spiral test mold, modified to give a mean deviation of less than 2.0% in duplicate tests, was used to determine the effects of temperature and metal composition on the fluidity of cast irons. Some of the tests were conducted to provide data on the effects of individual elements, and also on the interrelated effects of the components. From the test data, a tentative formula was derived which makes possible the prediction of relative effects of analysis variations and pouring temperatures on fluidity of the iron. (E25, CI)

133-E. This Mold Wash Works With All Common Casting Alloys. R. E. Morey and C. G. Ackerlind. *American Foundryman*, v. 21, Jan. 1952, p. 67-70.

Practical trials show that a bentonite-dextrin-silica flour mold wash developed by the Naval Research Laboratory gives excellent performance with all common ferrous and nonferrous casting alloys, including steel, brass, bronze, Al, Mg, and cast iron. (E19)

134-E. Vacuum Impregnation of Castings. L. W. Hull. *Journal of Metals*, v. 4, Jan. 1952, p. 30-32.

Vacuum impregnation of castings eliminates rejects under buyer's tests and insures against failure in service. Impregnating materials and methods. The method of vacuum impregnation followed by pressure. (E25)

135-E. Centrifugal Casting of Ferrous Metals. C. D. Donoho. *SAE Journal*, v. 60, Jan. 1952, p. 60-67.

A summary of experiences as reported by the Executive Committee of the SAE Iron and Steel Technical Committee. (E14, CI)

136-E. Uniform Grain Structure Favors Permanent Mold Over Sand for Gray Iron Castings. *Precision Metal Molding*, v. 10, Jan. 1952, p. 26-27, 64.

How De Walt, Inc., was able to get more uniform grain structure in gray-iron permanent-mold castings. High efficiency of die-cast Al rotors was also obtained. (E25, E12, CI, Al)

137-E. Brush Holders: Typical Electrical Components by Investment Casting. *Precision Metal Molding*, v. 10, Jan. 1952, p. 28-29.

Production by the Chicago Pneumatic Tool Co., Utica, N. Y. The article can be used in the as-cast condition. Parts made from bronze and Be-Cu are illustrated. (E15, T1, Cu)

138-E. Plaster Mold Casting; Greater Freedom of Coring for the Designer. *Precision Metal Molding*, v. 10, Jan. 1952, p. 31.

Advantages and limitations to be derived from the process as applied to nonferrous metals. (E16, EG-a)

139-E. "Wrappings" For This Power Package Are Die Cast Wherever Cores Can Be Pulled; Permanent Mold Cast With Sand Cores Where There Are Undercuts. Wm. Beecher. *Precision Metal Molding*, v. 10, Jan. 1952, p. 32-34, 56-57.

Die-cast and permanent-mold-cast components of a light-weight motorcycle. Major parts are fabricated from Al and Al alloys. (E12, E13, Al)

140-E. Investment Casting From Frozen Mercury Patterns as a Means of Reproducing Pieces That Are Too Intricate for Other Techniques. *Precision Metal Molding*, v. 10, Jan. 1952, p. 65-71.

The Mercast process which utilizes frozen mercury as a disposable pattern instead of wax or plastic. (E15)

141-E. Die Casting Die Design. Part VI. H. K. Barton and James L. Erickson. *Magazine of Tooling and Production,* v. 17, Jan. 1952, p. 80, 82, 86, 90, 98, 102, 119.

Design of vents. Advantages and limitations of each. Schematic diagrams. (E13)

142-E. Pressure-Tight Gunmetal Castings; Application of Research Results to Production Technique. L. Buckley and E. C. Mantle. *Foundry Trade Journal,* v. 91, Dec. 27, 1951, p. 727-729.

Some large-scale foundry trials have been carried out to exploit the results of research of the British Non-Ferrous Metals Research Association on the control of porosity in gunmetal castings. Test bars were used to follow changes in the gas content of the metal. Use of test bars in this way is an important departure from the usual practice of casting test-bars mainly for inspection purposes. (E25, Cu)

143-E. Synthetic Resins in the Foundry. *Foundry Trade Journal,* v. 91, Dec. 27, 1951, p. 737-739.

Further discussion of T.S.30 subcommittee report published in July 5 issue. See item 401-E, 1951. (E18)

144-E. Load-Deformation Curves on Dried Sand Specimens and Their Relation to Expansion Defects. R. G. Godding. *British Cast Iron Research Association Journal of Research and Development,* v. 4, Dec. 1951, p. 202-208.

Investigation was made to establish a relationship between the shape of stress-strain curves obtained for certain specimens of dried molding sand and the tendency of these sands to produce expansion scabs or buckles on the casting. Scabs are due to expansion of the sand on heating. An apparatus capable of measuring the deformation of sand at all loads up to breaking load was developed. (E18)

145-E. Die Castings and Investment Castings. E. N. Field. *Machinery* (London), v. 79, Dec. 27, 1951, p. 1130-1136.

Investigation of relative merits of these two methods for production of a particular component—a small bevel gear. Advantages and disadvantages of the two processes. Alloys suitable for each. Schematic diagrams. (E13, E15)

146-E. Formation of Nodular Graphite in Cast Iron. (In German). A. Wittmoser. *Giesserei,* v. 38, Nov. 1, 1951, p. 572-577.

Extensive research concerning the Mg treatment. Graphs, photomicrographs, and schematic diagrams. (E25, M27, CI)

147-E. Contribution to the Laws of Cupola Melting. (In German). W. v. Preen. *Giesserei,* v. 38, Nov. 15, 1951, p. 598-600.

Proposes general formulas for the cupola process which may also be applicable to the general blast-furnace process. Dependence of the formula upon varying plant conditions. (E10, D1, ST)

148-E. Casting Drop-Hammer Dies. *Aircraft Production,* v. 14, Feb. 1952, p. 59-64.

Methods recently developed by several companies in the U. S. for the proper use of new medium- and high-expansion plasters for close tolerance patterns, and also for controlling solidification in the mold. Materials are Zn alloys, Al, and bronze. Diagrams, tabular data, and illustrations. (E17, F22, Zn, Al, Cu)

149-E. Aircraft Magnesium Castings Must Meet Exacting Requirements. Herbert Chase. *Automotive Industries,* v. 106, Feb. 1, 1952, p. 40-43, 108.

Practices used by Howard Magnesium Foundry of Chicago on a Mg alloy known as ZRE-1 which contains small percentages of Zn, Zr, and rare earths. Some of the mechanical properties of this alloy. (E general, Q general, Mg)

150-E. New Foundry Techniques. Part I. *Canadian Metals,* v. 15, Jan. 1952, p. 28-30.

Advanced sand-reclamation systems, cleaning-room practices, new equipment and kindred foundry methods, and general consideration of problems posed by the pressures of the defense mobilization program. (E general)

151-E. A Reliable Leaded Bronze. Harold J. Roast. *Foundry,* v. 80, Feb. 1952, p. 117, 200-202.

Long and successful experience with the alloy ASTM B30-49 (3D) + 3% Zn recommends it for bearings and castings required to resist corrosion and internal pressure. Melting practice. (E10, T7, Cu)

152-E. Develops Pressurized Cupola. Ernest F. Fisher. *Foundry,* v. 80, Feb. 1952, p. 152-154.

Operation and advantages. Diagrams. (E10, CI)

153-E. Casting in Open Molds. Part III. Pat Dwyer. *Foundry,* v. 80, Feb. 1952, p. 163, 166.

Factors to be considered. (E19)

154-E. Impregnating Castings for Pressure Tightness. *Foundry,* v. 80, Feb. 1952, p. 172.

An improved sealant named P.E. No. 1 is a thermosetting copolymer, containing 100% solids, said to be capable of withstanding extreme pressures and temperatures and of avoiding reaction with industrial liquids and gases. Its application to ferrous and nonferrous castings is said to be quick, economical, and permanent. (E25)

155-E. Casting Nickel Plating Anodes. Herbert Chase. *Foundry,* v. 80, Feb. 1952, p. 204-205.

Foundry at Chevrolet Flint Mfg. Div. of General Motors Corp. contains two rocking-type electric indirect-arc furnaces, a set of cast iron molds in a pit, and auxiliary equipment, including tumbling barrels to remove fins. (E12, Ni)

156-E. Quantity Production of Spheroidal-Graphite Cast Iron. N. Croft. *Foundry Trade Journal,* v. 92, Jan. 3, 1952, p. 5-11.

Development, technique in foundry organization, and production control of the Mg process. (E25, CI)

157-E. Crossley Brothers: Modern Foundry Developments. *Foundry Trade Journal,* v. 92, Jan. 10, 1952, p. 31-36.

Layout and production practices of above British ferrous and nonferrous foundry. (E general)

158-E. Designing Components for Die-Casting. W. M. Halliday. *Foundry Trade Journal,* v. 92, Jan. 10, 1952, p. 37-43.

Sectional thickness of component; uniformity; parting lines; coring methods; threaded and plain holes; taper or draft; dimensional tolerances; and flash formation and removal. Manner in which design may be interpreted and adjusted to give the most suitable form for die casting, coupled with minimum cost of dies and parts. Casting alloys include Sn, Pb, Zn, Al, Mg, Cu. (E13, Sn, Pb, Zn, Al, Mg, Cu)

159-E. Basic-Lined Water-Cooled Cupola at Lynchburg Foundry. W. W. Levi. *Foundry Trade Journal,* v. 92, Jan. 10, 1952, p. 45-48.

The iron suited for spun pipe can be produced in the basic cupola with little or no pig iron, and with 50-70% steel scrap in the charge. (E10, CI)

160-E. Castings for A Small Diesel Engine. H. J. M. Conacher, and R. Leeks. *Foundry Trade Journal,* v. 92, Jan. 17, 1952, p. 57-65.

Production of gray iron components. Micrographs. (E11, CI)

161-E. Some Present-Day Practices in Patternmaking. *Foundry Trade Journal,* v. 92, Jan. 17, 1952, p. 67-70.

Discussion of paper by B. Levy (July 19, 1951 issue; see item 424-E, 1951. (E17)

162-E. Small Oklahoma Plant Does Big Business in Bronze Plaques and Metal Signs. Will C. Grant. *Industrial Gas,* v. 30, Jan. 1952, p. 9-10.

Basic to the fabrication of plaques and signs is the melting of metals in gas-fired furnaces especially adapted to the needs of the process; controlled temperatures are essential to proper pouring. (E10, Cu)

163-E. Bauxite Pig Iron. *Metal Progress,* v. 61, Jan. 1952, p. 160. (Condensed from "Possibilities of Utilizing the Pig Iron Produced From Calcium-Aluminate Slag of Foundries," N. Hajto and F. Varga, *Journal of Mining and Metallurgy* (Hungary) v. 4(82) Nov. 1949, p. 483-489.)

Bauxite pig iron is low in sulfur (0.049-0.57%) and high in carbon (0.5-1.9%); therefore, its suitability as a raw material was investigated. Melting experiments were conducted in a 24-in. diam. cupola. Results of the experiments proved the suitability of this iron for manufacture of gray iron castings. (E10, Fe, CI)

164-E. Impregnation Cuts Casting Porosity Rejects. *Product Engineering,* v. 23, Feb. 1952, p. 193.

Process which utilizes thermosetting copolymers. (E25)

165-E. Fundamental Research on the Flowabilities of Melts of Metals and Alloys. I. On the Flowabilities on Sn-Bi and Pb-Sn Systems. (In English.) Tadashi Yanagihara. *Science Reports of the Research Institutes, Tohoku University,* ser. A, v. 2, Dec. 1950, p. 843-855.

The fluidity is based on primary crystallization and eutectic crystallization. Both increase the viscosity of melt, but the effect of the latter was shown to be less than that of the former. Micrographs. (E25, N12, Sn, Bi, Pb)

166-E. Improved Forming Dies Perfected; Armour Research Develops Aid To Stampers. Thomas A. Dickinson. *Steel Processing,* v. 38, Jan. 1952, p. 25-26.

Plaster patterns for casting constant-tolerance forming dies at an unprecedentedly low cost. (E16, T5)

167-E. Mechanical Sand Removal by Tumbling From Small and Medium-Sized Castings. (In French.) *Fonderie,* Dec. 1951, p. 2738-2741.

Describes and diagrams apparatus. (E24)

168-E. Some Experiments on Production of Nodular Iron. (In Spanish.) Jose Antonio Bressel Egido. *Instituto del Hierro y del Acero,* v. 4, Apr.-June 1951, p. 112-130; July-Sept. 1951, p. 197-208.

Comprehensive correlation of experiments by foreign research workers and by the author. Tables, photomicrographs, and photographs. 17 ref. (E25, CI)

169-E. Coreblowing Machines—What They Can Do for Your Foundry. John A. Mescher. *American Foundryman,* v. 21, Feb. 1952, p. 36-40.

The basic facts of core blowing. Advantages and limitations of this method of making sand cores. Schematic diagrams. (E21)

170-E. Gating Gray Iron for Production Foundries. James J. Silk. *American Foundryman,* v. 21, Feb. 1952, p. 41-42.

Gating methods successfully used for snap flask work and for heavy floor work using edge gates. Diagrams and tabular data. (E22, CI)

171-E. Synthetic Resin Corebinders; A Report of the Institute of British Foundrymen. *American Foundryman,* v. 21, Feb. 1952, p. 51-56.

Technical, economic, and health aspects of the use of synthetic resins. (E18)

172-E. Modern Foundry Methods: Low Cost Mechanization Boosts Pro-

duction. *American Foundryman*, v. 21, Feb. 1952, p. 57-58.

Mechanized production at Arrow Pattern & Foundry Co., Chicago. Mechanical shakeout with automatic sand-conditioning and cooling, elevation of conditioned sand to hoppers over molding machines, 2 track conveyors for molds, with track return, for Al bottom boards, and manually operated chain hoists and monorail for molten-metal handling. (E11, A5, Al)

173-E. Gates and Heads for Steel Castings. John Howe Hall. *Foundry*, v. 80, Jan. 1952, p. 102-105, 237-242; Feb. 1952, p. 98-99, 212, 214-216, 218-220.

Factors to be considered. Methods of keeping the head molten to promote efficient feeding of the casting. Use of blind risers with steel castings. One method of determining the size of feeder head that should be applied to obtain a sound casting. (To be continued.) (E22, CI)

174-E. Symposium on Vermiculite in the Foundry. *Foundry Trade Journal*, v. 92, Jan. 24, 1952, p. 89-92.

Vermiculite products are discussed in the following papers: "Nature and Uses," J. E. Laschinger; "For Ferrous and Nonferrous Castings," G. Butler; and "For Steel Castings," A. Hirst. (E18)

175-E. Contraction and Blowholes. J. Leonard. *Foundry Trade Journal*, v. 92, Jan. 24, 1952, p. 95-98.

The theory of solidification of a casting involves liquid shrinkage, crust formation, and production of internal voids. Nomenclature and tentative definitions for various shrinkage phenomena. The net effect is illustrated by reference mainly to the American work on the influence of various conditions on the incidence of porosity. (E25)

176-E. Gray-Iron Castings. T. E. Eagan. *Mechanical Engineering*, v. 74, Feb. 1952, p. 115-117.

Rules of design necessary to achieve the desired mechanical and physical properties and a casting true to pattern and free from defects. Shrinkage rules, machining allowances, and internal stresses. (E25, CI)

F

PRIMARY MECHANICAL WORKING

48-F. The Fabrication of Copper Wire. Sidney Rolle. *Wire and Wire Products*, v. 27, Jan. 1952, p. 35, 37-47, 76-83.

A chronological development of the use of Cu. Surveys various stages in the production of Cu wire, including ore concentration, smelting, refining, rod rolling, pickling, annealing, butt welding, and wire drawing. Numerous diagrams. Three-page bibliography. (F28, Cu)

49-F. Rolling Characteristics of Various Steels. Edgar M. D. Herold. *Iron and Steel Engineer*, v. 29, Jan. 1952, p. 55-59; disc. p. 60-61.

Effects of alloying elements. Includes diagrams and tabulated data. (F23, Q general, AY)

50-F. End-Welded Collar Studs Increase Reheat Furnace Availability. Robert C. Singleton. *Iron and Steel Engineer*, v. 29, Jan. 1952, p. 152, 154, 157.

Advantages of insulating skid tubes and upright pipes in slab and billet reheating furnaces. (F21, K general)

51-F. Locked-Coil Rope Production. *Wire Industry*, v. 19, Jan. 1952, p. 63, 65.

Processes involved. (F28, G6, ST)

52-F. Mill Will Speed Tapered Sheets. A. H. Langenheim. *Aviation Week*, v. 56, Feb. 4, 1952, p. 47-48.

A new rolling mill which will mass-produce sheets up to 10 ft. wide for aircraft use, and cut time and chip wastage in slab milling. Application to Al alloys. (F23, Al)

53-F. Electrical Developments in 1951. W. H. Poole. *Blast Furnace and Steel Plant*, v. 40, Jan. 1952, p. 58-63.

Developments applied to various types of rolling mills for steel. (F23, ST)

54-F. Rolls and Rolling. Part XXXI. Rails. E. E. Brayshaw. *Blast Furnace and Steel Plant*, v. 40, Jan. 1952, p. 82-88.

Roll-pass diagrams and detailed textual explanations. (F23)

55-F. How Bridgeport Brass Solved the Problem of Limited Room in the Vertical Plane. W. J. Krailing. *Industrial Gas*, v. 30, Jan. 1952, p. 16-17, 23-25.

Ground floor had working overhead space of only 12 ft., to be used for nonferrous wire and rod drawing operations and heat treating for finish annealing. Ingenious "panpull" furnace provided the answer. (F28, J23, Cu)

56-F. Develop New Forging Techniques for Aircraft Parts. G. W. Papen and W. Schroeder. *Iron Age*, v. 169, Feb. 7, 1952, p. 135-138.

Techniques studied for forging of Al and Mg alloy aircraft outer skin panels. Parts are thin, and have integral stiffening ribs. Forgings with webs thinner than 0.1 in. have been made with draft angles as low as 1°. Areas of forgings are much larger than conventional practice would indicate the press could handle. (F22, Al, Mg)

57-F. Rotating Hearth Reheating Furnace. *Metal Treatment and Drop Forging*, v. 19, Jan. 1952, p. 12.

Furnace developed by the French firm of Stein-et-Roubaix. Applicable to shapes (such as round billets for tubemaking) which cannot conveniently be reheated in a continuous pusher-type furnace. (F21)

58-F. Small Drop Forgings. H. A. Whiteley. *Metal Treatment and Drop Forging*, v. 19, Jan. 1952, p. 20-26.

The technique involved and the various important factors influencing the quality of the products. Preparation of dies and their heat treatment, and the design of clipping tools. Some typical small forgings are illustrated. (F22, ST)

59-F. Furnace Practice and Design. K. F. Bray. *Metal Treatment and Drop Forging*, v. 19, Jan. 1952, p. 33-34; disc., p. 34.

Furnace practice and design in representative forging plants. (F22)

60-F. What's Happening In The Forging Industry? John C. McComb. *Steel Processing*, v. 38, Jan. 1952, p. 20-21.

General discussion and table showing shipments of steel forgings in net tons for last 5 yrs. (F22, A4, ST)

61-F. Fabrication of Duralumin Strip of Various Thicknesses. (In French.) *Revue de l'Aluminium*, v. 28, Nov. 1951, p. 396.

French equipment which can manufacture strips up to 32 ft. long with a thickness from 0.709 to 0.031 in. (F23, Al)

62-F. Recent Trends Toward Production of Large Forgings. (In Spanish.) J. A. Sanderson. *Instituto del Hierro y del Acero*, v. 4, Jan.-Mar. 1951, p. 80-84. (Condensed from *Journées de la Grosse Forge.)*

Quality, size, and weight. Includes table showing size of equipment available at various locations in Russia, Japan, Italy, Czechoslovakia, Germany, Great Britain, France, and the U. S. (F22, ST)

63-F. Experiments on Weldability of a Cr-Ni-Mo Steel Containing "Bright Spots" (Flakes). (In Spanish.) Rafael Cabezudo Sanchez. *Instituto del Hierro y del Acero*, v. 4, July-Sept. 1951, p. 189-196.

Experiments show that flakes in above steel (low-alloy) can be eliminated by forging with reductions of 3.5-4 times, even when cooling is done in the open air. Need for additional experiments to establish the mechanism of this effect. Macrographs, tables, and graphs. (F22, K9, AY)

64-F. Sheet and Strip Rolling and the Possibility of Their Application in Spain. (In Spanish.) Isidro Sans Darnis. *Instituto del Hierro y del Acero*, v. 3, Oct.-Dec. 1950, p. 270-281.

Former and modern techniques, typical installations, advantages, and the Steckel mill. Diagrams show three kinds of sheet and strip rolling set-ups. (F23)

65-F. Forging Advances Point Way to Savings. *Aviation Week*, v. 56, Feb. 11, 1952, p. 22, 25-26.

Unit-cost comparison of four fabrication methods for aircraft parts (Al and Mg alloys) developed by Northrop. Waste through machining and improved techniques in forging. (F22, Al, Mg)

66-F. Heavy-Duty Mechanical Forging Presses. *Engineering*, v. 173, Jan. 25, 1952, p. 97-99.

Presses in use at Messrs. B. and S. Mossey, Ltd., Openshaw, Manchester, England. (F22)

67-F. Rare Metal Fabrication. *Metal Industry*, v. 80, Jan. 25, 1952, p. 66.

Methods used by Murex Ltd., of England, in the forging and rolling of Zr, W, Mo and Ta. (F22, F23, Zr, W, Mo, Ta)

68-F. Hot and Cold Forging Methods. (Concluded.) C. W. Hinman. *Modern Machine Shop*, v. 24, Feb. 1952, p. 112-114, 116, 118, 120.

Use of forging equipment in the manufacture of ordnance material from steel. (F22, ST)

69-F. An Examination of Modern Theories of Rolling in the Light of Rolling Mill Practice. (Continued). N. H. Polakowski. *Sheet Metal Industries*, v. 29, Jan. 1952, p. 11-16.

Various methods and apparatus for control of strip thickness. 16 ref. (To be continued.) (F23, S14)

70-F. Hot Forming Practice at Northrop Aircraft. Part I. Gilbert C. Close. *Steel Processing*, v. 38, Jan. 1952, p. 23-24.

Hot forming conditions and requirements, heating methods and mechanical properties of Mg alloy and Al alloy sheet and extrusions. (To be continued.) (F21, F general, G general, Al, Mg)

71-F. (Book) Teoriia Prokatki (Obshchie Osnovy Obrabotki Metallov Davleniem.) (Theory of Rolling—General Basis of Forming Metals by Pressure.) S. I. Gubkin. 602 pages. 1950. State Scientific-Technical Publishing House for Ferrous and Nonferrous Metallurgy, Moscow, U.S.S.R.

Intended as a textbook for students in the metallurgical trades, but can be considered as a handbook of rolling and related processes. The question of plastic deformation is treated theoretically and is discussed in relation to many metallurgical factors. (F23)

G

SECONDARY MECHANICAL WORKING

81-G. Titanium; Design and Manufacturing Technique. O. A. Wheelon.

Aircraft Production, v. 14, Jan. 1952, p. 21-28.

See abstract of "Formability of Titanium Investigated" in *Iron Age;* item 23-G, 1952. (G general, Ti)

82-G. Fuel Tanks Formed With Hydraulic Pressure. E. A. Schrodeck. *Automotive Industries,* v. 106, Jan. 15, 1952, p. 33, 108.

Final sizing of aircraft fuel tank after welding is done by placing heat treated tank inside large sizing die made in halves and bolted together, and pumping in hydraulic fluid. The tank is stretch-formed to a 6% elongation. (G9, Al)

83-G. Tank Hull Output Upped by New Techniques. Thomas Mac New. *Automotive Industries,* v. 106, Jan. 15, 1952, p. 38-42, 112.

Processes for welding, drilling, machining, milling, and inspection of tank hulls at Eddystone plant of Baldwin-Lima-Hamilton Corp.
(G17, K general, S general, ST)

84-G. Jet Sprayed Oil Ups Tool Life 1200 Pct. *Iron Age,* v. 169, Jan. 17, 1952, p. 97-99.

See abstract of "Jet Stream Lowers Cutting Tool Temperatures" in *Steel;* item 72-G, 1952. (G21)

85-G. How to Double a Tool's Output. *Business Week,* Jan. 19, 1952, p. 74, 76, 78, 80.

See abstract of "Jet Stream Lowers Cutting Tool Temperatures" in *Steel;* item 72-G, 1952. (G21)

86-G. Little High-Pressure Jets From Below Cool Cutting Edges Better. R. J. S. Pigott. *American Machinist,* v. 96, Jan. 21, 1952, p. 281-286.

See abstract of "Jet Stream Lowers Cutting Tool Temperatures" in *Steel;* item 72-G, 1952. (G21)

87-G. New Metal Cutting Concept Lengthens Tool Life. *Steel,* v. 130, Jan. 21, 1952, p. 76.

Process developed by K. R. Blake, Metalloid Corp., Huntington, Ind., uses a chemical compound known as Metalloid X-20, which acts to limit the movement of the atoms in the crystal lattice of the metal when it is being cut. Tool life has been increased up to 900% and speeds and feeds 25-35%. (G17)

88-G. Oil Jet Increases Cutting Tool Life. *Iron and Steel Engineer,* v. 29, Jan. 1952, p. 146-148.

See abstract of "Jet Stream Lowers Cutting Tool Temperatures" in *Steel;* item 72-G, 1952. (G21)

89-G. Integrally Stiffened Wing Panels Formed by Shot Peening Method. Ted C. Simmons. *Western Metals,* v. 10, Jan. 1952, p. 25-27.

Equipment and procedures. 75S-T6 Al plate is the material used.
(G23, Al)

90-G. Shot Peening Deserves Consideration During Initial Design. *SAE Journal,* v. 60, Jan. 1952, p. 41-46. (Based on "Ordnance Applications of Shot Peening", by Earl H. Abbe; "Shot Peening of Heavy-Duty Transmission Gearing", by Thomas Backus; and "Shot Peening in the Design of Machine Parts", by John C. Straub.)

Designing new machine parts from the start to be shot peened may result in better products in many cases and reduce production expense in other cases. Where ordinary cast iron is impractical, the possibility of using shot-peened nodular iron is reviewed. (G23, CI)

91-G. Exhaust Ventilation for Machine Tools Used on Materials of High Toxicity. H. F. Schulte, E. C. Hyatt, and F. S. Smith, Jr. *A.M.A. Archives of Industrial Hygiene and Occupational Medicine,* v. 5, Jan. 1952, p. 21-29.

Factors to be considered in design of machines. Data on U, Th, Be, Tl, and Pb.
(G17, A7, U, Th, Be, Tl, Pb)

92-G. Cold Pressing of Steel. J. Lomas. *British Steelmaker,* v. 13, Jan. 1952, p. 28-33.

The general characteristics of mechanical and hydraulic presses and also the types of steel which are suitable for cold pressing, the metallurgy of the process, and the various treatments required to insure a satisfactory product. (G1, ST)

93-G. The Working of Aluminium in the Shipyard. *Aluminium Development Association* (London), Information Bulletin 18. Nov. 1951, 36 pages.

Machining, methods of joining, protective coatings, and general notes on storage. Recommended alloys are listed.
(G17, K general, L general, Al)

94-G. Plastic Deformation During the Cutting of Steel. (In Russian.) V. V. Kuziushin. *Stanki i Instrument,* v. 22, Apr. 1951, p. 19-21.

From theoretical considerations and experimental data, a coefficient of information was developed which is used in computing the deformation of metal during cutting. Results are charted. (G17, ST)

95-G. Study of Filing. III. (In Japanese.) Hidehiko Takeyama. *Journal of Mechanical Laboratory,* v. 5, July 1951, p. 89-91.

Structure and roughness of filed surfaces, adherence of metal to the file edges, and influence of oil on the process. Graphs and micrographs. (G17)

96-G. An Experiment in Superfinishing. (In Japanese.) Renzo Kaneko and Kunio Yamada. *Journal of Mechanical Laboratory,* v. 5, Aug. 1951, p. 165-168.

An investigation of superfinishing of cast iron. Apparatus is diagrammed, surface structures illustrated, and data tabulated.
(G19, CI)

97-G. Superfinishing of the Lace Surface of Ball Bearings. (In Japanese.) Renzo Kaneko, Kunio Yamada, and Yoshihiko Watanabe. *Journal of Mechanical Laboratory,* v. 5, Sept. 1951, p. 183-187

Apparatus and procedure. Includes graphs. (G19, ST)

98-G. Study on Ball Bearing Materials. (In Japanese.) Etsuo Hayashi and Shigemitsu Demachi. *Journal of Mechanical Laboratory,* v. 5, Sept. 1951, p. 188-191.

Graphs and photomicrographs show results of wear on surface structure. Conclusions concerning effects of various fabrication variables are summarized in English abstract.
(G general, Q9, ST)

99-G. Tungsten-Carbide Tooling. Part I. Factors in the Design and Operation of Multiple-Edge Tools With Particular Reference to Milling Cutters. Part II. Tip-Forms Associated With the Design of Brazed and Inserted Teeth; Methods of Retaining Inserts. *Aircraft Production,* v. 14, Jan. 1952, p. 30-35; Feb. 1952, p. 68-72.
(G17, T6, C-n)

100-G. Pipe Fabrication With Oxy-Acetylene. E. P. Auler. *Canadian Metals,* v. 15, Jan. 1952, p. 40, 42, 44.

Various applications in cutting, gouging and heating. (G22, J2)

101-G. Gouging and Cutting Torch Uses Electric Arc and Compressed Air. Hubert Chappie. *Foundry,* v. 80, Feb. 1952, p. 189-190.

Arcair process which is a means of removing metal, through utilization of a torch requiring a ⅜ x 12-in. carbon electrode, an ordinary 300-400-amp. d.c. welding machine, and a compressed-air supply. (G22)

102-G. The Arcair Torch. *Canadian Metals,* v. 15, Jan. 1952, p. 26-27.

See abstract of "Gouging and Cutting Torch Uses Electric Arc and Compressed Air", Hubert Chappie, *Foundry;* item 101-G, 1952. (G22)

103-G. Cold Header Produces Commutator Segments. Herbert Chase. *Iron Age,* v. 169, Jan. 24, 1952, p. 70-71.

Production of Cu parts for d.c. motors and generators by cold heading machines and trimmers that operate automatically. Special machines separate good parts from scrap. (G10, Cu)

104-G. Bolster Plate Threads Quickly Repaired With Wire Inserts. *Iron Age,* v. 169, Feb. 7, 1952, p. 145.

Press down-time for repair of bolster plate threads has been substantially reduced through use of helical wire thread inserts at Stewart-Warner Corp., Chicago. Stainless steel Heli-Coil thread inserts are formed from wire with a diamond-shaped cross-section. The wire-insert method produces a permanently repaired thread. (G1, SS)

105-G. Radioactive Tracers for Rapid Measurement of Cutting Tool Life. M. Eugene Merchant and E. J. Krabacher. *Journal of Applied Physics,* v. 22, Dec. 1951, p. 1507-1508.

The method consists, in essence, of machining with a cutting tool which has been rendered radioactive by neutron irradiation in a nuclear reactor and measuring the radioactivity of the collected particles worn from the tool during a few seconds of cutting. (G17, S19, C-n)

106-G. New Cooling Oil and Lubricating Process to Increase Tool Life 300-1200%. *Machine and Tool Blue Book,* v. 48, Feb. 1952, p. 137-140, 142, 144.

See abstract of "Jet Stream Lowers Cutting Tool Temperatures", *Steel,* item 72-G, 1952. (G21)

107-G. Advances in Machining and Cutting Operations. Taylor White. *Metal Progress,* v. 61, Jan. 1952, p. 84-86.

Variables are grouped under four headings—material, dies, equipment, and management. Improvement in machinability. (G17)

108-G. Magnethermic Induction Billet Heaters. *Modern Metals,* v. 7, Jan. 1952, p. 36-37.

Billet heaters for use in connection with the hot-extrusion of light metals. (G21, Al, Mg)

109-G. Ultra-High Pressure Lubrication. *Screw Machine Engineering,* v. 13, Feb. 1952, p. 51-53.

See abstract of "Jet Stream Lowers Cutting Tool Temperatures", *Steel,* item 72-G, 1952. (G21)

110-G. Cool Grinding Prevents Tool Failure. H. Pottle. *Screw Machine Engineering,* v. 13, Feb. 1952, p. 55-56.

The damages which occur when tools are improperly ground. In a new technique to keep the work cool developed by Do All Co., the coolant is forced directly through the wheel, from inside out. (G21)

111-G. Stampings Formed Faster. Herbert Chase. *Steel,* v. 130, Feb. 4, 1952, p. 90-91.

Unusual stampings produced by Leake, Monroe, Mich. Roof panels, 17 sq. ft. in area, are drawn from 0.070-in. steel and later glass-surfaced on both sides. A tractor part sheared from ¾-in. square steel bar costs less. (G4, ST)

112-G. Revolutionary Metal Cutting Development Announced. *Steel Processing,* v. 38, Jan. 1952, p. 27-28.

See abstract of "Jet Stream Lowers Cutting Tool Temperatures", *Steel;* item 72-G, 1952. (G21)

113-G. Milling Product Analysis and Equipment Selection. Earl P. Leeds. *Tool Engineer,* v. 28, Feb. 1952, p. 37-40.

Improved milling through proper selection of equipment and ingenuity of application. (G17, ST)

114-G. Current Research on Improving the Economy of the Oxygen-Cutting Process. (In French.) M. Renaudie. *Soudure et Techniques Connexes,* v. 5, Nov.-Dec. 1951, p. 263-266.

Oxygen-cutting of very thick plates and processes which result in a large reduction of the consumption of gases were investigated. Includes graphs. (G22)

115-G. Causes and Elimination of Deep Drawing Defects With Consideration of the Deep Drawing Testing Process. (In German.) Gerhard Oehler.

Berichte der Deutschen Keramischen Gesellschaft e. V. und des Vereins Deutscher Emailfachleute e. V., v. 28, Oct. 1951, p. 576-577.

Discusses briefly facts presented in two tables with illustrations on the deep drawing of steel plates. (G4, ST)

116-G. Compressed Air; Carbon Arc Speed Metal Cutting. *Iron Age*, v. 169, Feb. 14, 1952, p. 134-135.

Process uses the Arcair torch which requires a ⅜ x 12 in. carbon electrode, an ordinary 300-400 amp. d.c. welding machine and compressed air. Development work was done by National Supply Co. (G22)

117-G. Automotive Drawing Compounds—Specifications and Applications. J. T. O'Reilly. *Lubrication Engineering*, v. 8, Feb. 1952, p. 14-17.

Emphasizes the practice of lubrication in press forming operations on low-carbon steels. (G21, CN)

118-G. Revolutionary Method of Cooling and Lubricating Cutting Tools. *Machinery* (American), v. 58, Feb. 1952, p. 166-169.

See abstract of "Jet Stream Lowers Cutting Tool Temperatures", *Steel*, Item 72-G, 1952. (G21)

119-G. Design and Application of Tungsten Carbide Blanking and Piercing Tools. K. L. Pickett. *Machinery* (London), v. 80, Jan. 24, 1952, p. 165-167.

Methods of working the material and pitfalls to be avoided. (G17)

120-G. Machining Titanium Alloys. *Magazine of Tooling and Production*, v. 17, Feb. 1952, p. 80, 112-113, 116-118. (Reproduced from "Air Force Curtiss-Wright Machinability Report," v. 2, Sec. 5.)

The present status of Ti. Machining characteristics and mechanical properties. (G17, Q general, Ti)

121-G. A Particular Problem in the Re-Design and Development of a Pressed-Metal Assembly. J. A. Grainger. *Sheet Metal Industries*, v. 28, Nov. 1951, p. 1009-1013; Dec. 1951, p. 1107-1112.

As applied to an automotive air-filter assembly. (To be continued.) (G4)

122-G. Powder Processes, A New Industrial Tool. A. B. Kinzel, D. Swan, H. Biers, and H. R. Pufahl. *Transactions of the Institute of Welding*, v. 14, Oct. 1951, p. 154-159.

See abstract from *Canadian Metals;* item 375-G, 1951. (G22, EG-a, CI)

123-G. Possibilities of the Pre-Stressing of Metallic Constructions. W. Soete. *Transactions of the Institute of Welding*, v. 14, Oct. 1951, p. 161-167; disc., p. 167-168.

What happens in systems in equilibrium under external forces and in systems in internal equilibrium. Data are graphed. (G23, ST)

H

POWDER METALLURGY

14-H. Hot Pressing Silver Powder. K. Ogawa and G. Matsumura. *Journal of Metals*, v. 4, Jan. 1952, p. 28-29.

Change of the aggregated state of Ag powders at various temperatures, and temperature range in which the effect of hot pressing is most marked. The compressibility of powder under low pressures at different temperatures was measured, and from these experiments, three degrees of change of the aggregated state at each temperature were observed. Results are graphed and tabulated. 10 ref. (H14, Ag)

15-H. Magnetic Parts by Powder Metallurgy. W. J. Polydoroff. *Electrical Manufacturing*, v. 49, Jan. 1952, p. 97-99, 228-230, 232, 234, 236, 238, 240, 242.

Properties of sintered compacts for d.c. applications, and the beneficial effect of alloy additions tending to produce increased density. Iron powder was the principal material involved. Quasi-laminated material offers promise for a.c. service. (H general, P16, Fe, SG-n, p)

16-H. Iron Powder: a Non-Allocated Metal. Philip R. Kalischer. *Precision Metal Molding*, v. 10, Jan. 1952, p. 23-25, 54-55.

Availability and probable military uses. Parts that can be made from iron powder. (H general, T general, Fe)

17-H. Bronze Cams and Iron Followers in Matched Sets by Powder Metallurgy. *Precision Metal Molding*, v. 10, Jan. 1952, p. 35, 37-40.

Methods used in production of the parts for brake-control valves. The cams are made of sintered bronze and the follower of sintered iron. Dissimilar metals were chosen for wear and bearing properties. (H general, T5, Fe, Cu)

18-H. The Manufacture of Cemented Tungsten Carbide Dies. B. E. Berry. *Wire Industry*, v. 19, Jan. 1952, p. 45-46, 49-52, 55.

See abstract from *Murex Limited Review;* item 54-H, 1951. (H general, W, C-n)

19-H. Investigation of Sintered Aluminum. (In German.) Edith Boneisch and Wilhelm Wiederholt. *Zeitschrift für Metallkunde*, v. 42, Nov. 1951, p. 344-348.

"SAP", a new sintered Al material produced in a research laboratory in Germany, contains 88.8% metallic Al, 10.5% Al_2O_3, and small percentages of Si, Fe, Ti, and Cu. Chemical, physical, mechanical, and structural characteristics, and corrosion resistance. Tables, charts, and micrographs. (H general, R general, Al)

20-H. The Production and Properties of Oxide-Reduced Copper Powder. C. Ellwood and W. A. Weddle. *Journal of the Institute of Metals*, v. 80, Jan. 1952, p. 193-206.

A study of some of the principal variables in the oxidation of Cu wire, the comminution of the oxide so produced and its subsequent reduction to metallic copper powder. The properties of the powder and the effect on the final sintered product of variables in the production of the oxide and in subsequent pressing and sintering. 13 ref. (H10, H11, Cu)

21-H. Unrelated Simultaneous Interdiffusion and Sintering in Copper-Nickel Compacts. J. M. Butler and T. P. Hoar. *Journal of the Institute of Metals*, v. 80, Jan. 1952, p. 207-212.

The progress of interdiffusion in Cu-Ni compacts was followed by metallographic examination of these compacts stained with the vapor from aqueous ammonium polysulfide. Results of the experiments show that, although metallic interdiffusion and sintering can and do occur simultaneously, the two phenomena are not causally related, and also that interdiffusion can, in the early stages of heat treatment, produce porosity and cause expansions that are the reverse of sintering. Micrographs. 24 ref. (H15, N1, Cu, Ni)

22-H. Sizing Powder Particles. *Metal Industry*, v. 80, Jan. 4, 1952, p. 9-10.

The Photosedimentometer designed to put subsieve analysis on a routine basis. It is a particle-size comparator for maintaining consistency of powdered materials. (H11)

23-H. Powder Metallurgy 1925-1950-19?? A. J. Langhammer. *Metal Progress*, v. 61, Jan. 1952, p. 72-75.

A review indicating future trends. (H general)

24-H. The Adhesion of Powders and Its Use in the Determination of Particle Sizes. (In German.) E. Cremer, F. Conrad, and Th. Kraus. *Angewandte Chemie*, v. 64, Jan. 7, 1952, p. 10-11.

Magnesite, dolomite, Fe powder, and Mo powder were tested. Base materials were glass, magnesite, Ni, or Mo. Useful relationships applicable in particle-size determination were discovered. Data are charted and tabulated. (H11, Fe, Mo, Ni)

25-H. Crystal Size Distribution of Electrolytic Metal Powders; Powders From Fused Electrolyte Baths. Chuk-Ching Ma. *Industrial and Engineering Chemistry*, v. 44, Feb. 1952, p. 342-346.

A study was made of the effect of bath temperature and current density upon the size and size distribution of metal crystals produced electrolytically from fused salt baths. Results of experiments on Cb, Ta, and W powders. Two generalized rules were established: The higher the bath temperature, the coarser will be the metal crystals. The higher the current density, the finer will be the metal crystals. (H10, H11, Cb, Ta, W)

26-H. Explosive Characteristics of Titanium, Zirconium, Thorium, Uranium and Their Hydrides. Irving Hartmann, John Nagy, and Murray Jacobson. *U. S. Bureau of Mines*, Report of Investigations 4835, 16 pages, Dec. 1951.

Results of experiments on 22 samples of Ti, Zr, Th, U, powders, and their hydrides. Data are graphed and tabulated. 16 ref. (H11, Ti, Zi, Th, U)

27-H. (Book) Powder Metallurgy. 159 pages. British Information Services. 30 Rockefeller Plaza, New York. $4.25.

Research information on production and properties of sintered metals and alloys. Among the materials considered are 28 commercial Fe powders, sintered Fe-Cu compacts, Cu-Al alloys and Ti. Studies of surface energies of various metals and binary alloys, powder densities, and strength and hardness of sintered metals and alloys are included. (H general, Fe, Cu, Al, Ti)

J

HEAT TREATMENT

41-J. Quench-Temper Treatment Improves Nodular Irons. J. E. Rehder. *Iron Age*, v. 169, Jan. 17, 1952, p. 89-93.

Results of an investigation to determine the effect of Si, Ni, Cu, P, Mo, and Mn on the mechanical properties of nodular irons. Results of quench-temper treatment on a large number of heats at various temperatures. (J26, J29, Q general, CI)

42-J. Flame-Hardening—A Flexible Method of Surface Treatment. H. V. Inskep. *Machinery* (American), v. 58, Jan. 1952, p. 166-171.

Flame hardening as applied to various types of parts. Data for cast irons, and carbon and alloy steels are tabulated. (J2, CI, CN, AY)

43-J. Putting the Starch in Steel. John Pfeiffer. *Steelways*, v. 8, Jan. 1952, p. 20-23.

Heating, quenching, and tempering methods for controlling the internal crystal structure of steel. Micrographs. (J26, J29, N8, ST)

44-J. Control of Rail-End Hardening. LaMotte Grover. *Welding Journal*, v. 31, Jan. 1952, p. 7-17.

Manual processes of flame hardening ends of ordinary carbon steel rail in the field using the compressed air-quench method and the self-quench method. (J2, CN)

45-J. Heat Treatment and Pickling of the Stainless Steels. (Continued.)

Lester F. Spencer. *Magazine of Tooling and Production,* v. 17, Jan. 1952, p. 54, 56, 128, 130, 132, 150, 158, 164-167, 174.

The hardening procedure. Charts show the effect of Cr and C on the as-quenched hardness of three stainless steel compositions—Types 410, 403, and 416. Tables give temperature ranges for various types of stainless steels. Choice of furnace equipment. Methods of scale removal. 12 ref. (J26, L12, SS)

46-J. Gaseous Annealing of Malleable Castings; Operations at William Lee & Sons, Dronfield. J. C. Mantell. *Foundry Trade Journal,* v. 91, Dec. 27, 1951, p. 741-744.

A year ago a standard Birlec 300-kw. elevator-type electric malleablizing furnace was installed, for annealing whiteheart malleable castings. Since that time, comprehensive and accurate records have been kept of the 90-odd heats annealed, and monthly digests of data have been derived from these day-to-day observations. (J23, CI)

47-J. Electrode Salt Baths. *Machinery Lloyd* (Overseas Edition), v. 23, Dec. 22, 1951, p. 87-89, 91, 93.

Use for obtaining heat-treatment temperatures between 550 and 1350° C. In addition, a layer of salt adheres to components being removed from the bath, thus preventing contact with the air and preventing scaling. (J2)

48-J. Marquenching. J. Lomas. *Machinery Lloyd* (Overseas Ed.), v. 24, Jan. 5, 1952, p. 91, 93-94.

Advantages and disadvantages of marquenching method of heat treatment involving quenching in hot oil. (J26)

49-J. Application of Hydrocyanic Acid in Case Hardening. (In German.) Alb. Stähler. *Zeitschrift des Vereines Deutscher Ingenieure,* v. 93, Dec. 11, 1951, p. 1093-1097.

Results of experiments applied to various carbon and low-alloy steels. Results are charted, tabulated, and illustrated by photomicrographs. Vickers hardness and wear resistance were determined. (J28, Q29, Q9, CN, AY)

50-J. Study on Heat Treatment of Parts of Bicycle Chain. A Report on Strain Produced by Heat Treatment of the Inner Plate of Bicycle Chain. (In Japanese.) Etsuo Hayashi and Shigemitsu Demachi. *Journal of Mechanical Laboratory,* v. 5, Aug. 1951, p. 131-134.

Includes tables and graphs. (J26, CN)

51-J. Role of Boron Steels in the Present Emergency. P. R. Wray. *Industrial Heating,* v. 18, Oct. 1951, p. 1738-1740, 1742, 1936; Nov. 1951, p. 1986, 1988, 1990, 1992; Dec. 1951, p. 2220, 2222, 2224, 2226; v. 19, Jan. 1952, p. 62, 64, 66, 178, 180.

Emphasis on effects of boron on hardenability and associated transformation, mechanical properties, grain size, and applications. (J26, M27, Q general, AY)

52-J. Ford Automotive Parts Hardened by Dry Cyaniding. *Industrial Heating,* v. 19, Jan. 1952, p. 26-28, 30, 32-34, 186.

Furnace fired by 12 gas-fired radiant tubes for hardening automobile parts. Composition and hardness of carbon steel parts before and after heat treatment. Diagram gives layout, showing arrangement of heating zones and quenching mechanism. (J28, Q29, CN)

53-J. Fast Quench Oil Improves Hardenability in Aircraft Steels. James McElgin. *Iron Age,* v. 169, Jan. 24, 1952, p. 72-74.

New high-speed quenching oil which makes possible maximum hardness penetration in thicker sections of aircraft low-alloy steels. Performance characteristics are compared. Data are graphed and tabulated. (J2, Q29, AY)

54-J. Heat Treated Properties Predictable in Complex Assemblies. J. L. Waisman. *Iron Age,* v. 169, Feb. 7, 1952, p. 146-149.

Technique used, for any shape of heat treatable parts, for specifying heat treatment. The system consists of a simple scheme for determining the diameter of a cylinder whose center has the same cooling rate as the center of the part in question. This diameter is called the "equivalent round" for that shape. (J26, ST)

55-J. Heat-Treatment of Titanium-Rich Titanium-Iron Alloys. H. W. Worner. *Journal of the Institute of Metals,* v. 80, Jan. 1952, p. 213-216.

Alloys with 2-6% Fe can be hardened appreciably by water quenching them from the β-Ti-Fe solid-solution region. Some of the alloys which could be retained as β-solid-solutions by water-quenching exhibited age hardening effects when heated for a few hours in the range 220-450° C. (J26, J27, Ti)

56-J. Rocket Parts Effectively Heat Treated in Mechanized Salt Bath Furnace. Kenneth Rose. *Materials & Methods,* v. 35, Jan. 1952, p. 90-91.

Heat treating steps for the above. SAE 4140 steel is used. (J2, AY)

57-J. Mechanized Heat Treatment Points to New Goals in Costs and Quality. Arthur H. Allen. *Metal Progress,* v. 61, Jan. 1952, p. 68-71.

How integration of heat treating equipment into the parts-production line makes it in fact a machine tool with built-in functions of loading movement and discharge. Highlights

of progress in this field. (J general)

58-J. Annealing Steel Strip. *Metal Treatment and Drop Forging,* v. 19, Jan. 1952, p. 13-14.

The annealing plants at both the Abbey and Trastre Works of the Steel Co. of Wales Ltd. (J23, ST)

59-J. The Surface Hardening of Steel. Part XII. Induction Heating. (Concluded.) G. T. Colegate. *Metal Treatment and Drop Forging,* v. 19, Jan. 1952, p. 35-42.

The high-frequency induction heating technique for surface hardening. Principles involved and controlling factors for depth of hardening. A comparison is made with other surface hardening treatments already discussed in this series. 78 ref. (J2, ST)

60-J. Testing Round Carbon Drill Steel. Paul L. Russell. *Mining Engineering,* v. 4, Jan. 1952, p. 42-43.

Progress report of an experiment involving heat treatment of the shank ends of drill steel. Drilling tests were made on two types of rock. The purpose was to determine the effect of an increase in soaking time during the hardening process. (J26, Q29, T6, TS)

61-J. Progress In Heat Treating and Furnaces in 1951. Howard E. Boyer. *Steel Processing,* v. 38, Jan. 1952, p. 17-19.

(J general)

62-J. Recent Work and Opinions on the Age Hardening of Aluminum Alloys. (In German.) F. Rohner. *Schweizer Archiv für angewandte Wissenschaft und Technik,* v. 17, Nov. 1951, p. 332-336.

Critical review of literature reveals that earlier views on this phenomenon are being challenged. 23 ref. (J27, Al)

63-J. The "Hardenability" of Steel, a Contribution to the Clarification of Terminology. (In German.) E. Bickel. *Schweizer Archiv für angewandte Wissenschaft und Technik,* v. 17, Nov. 1951, p. 347-348.

Proposes that a distinction be made between "hardenability" and "intensity of hardening". (J26, ST)

64-J. Investigation of Annealing Resulting From the Heat Involved in Hot Working, and Accompanying Isothermal Transformations. (In German.) Erich Theis. *Stahl und Eisen,* v. 71, Dec. 1951, p. 1433-1438; disc., p. 1438-1440.

Investigation on a roller-bearing steel containing 1% C and 1.5% Cr; structural steel containing 0.55% C, 1.0% Cr, and 0.10% V; "silver" steel containing 1.2% C and 1.0% W; high speed steel containing 0.95% C, 4.0% Cr, 3.0% Co, 2.3% V, and 10% W; stainless steels containing (1) 0.4% C and 13% Cr, (2) 0.25% C, 18% Cr, and 1.5% Ni; and toolsteel containing 0.5% C, 0.15% Mo, and 3% Ni. Advantages and applications of the process in which annealing intentionally results from the heat of hot working. (J23, N8, ST)

65-J. Heat Treatment of Large Forgings. (In Spanish.) R. Garcon. *Instituto del Hierro y del Acero,* v. 4, Apr.-June 1951, p. 170-178. (Translated from *Journées de la Grosse Forge.)*

Measurement of cooling velocities. Results of dilatometric tests on low-alloy Cr-Ni-Mo and Cr-Ni steels. Data are tabulated and charted. (J26, M23, AY)

66-J. Effect of Low Temperatures on the Properties of Carbon and Special Steels. Subzero Treatment. (In Spanish.) *Instituto del Hierro y del Acero,* v. 4, July-Sept. 1951, p. 253-255. (Translated from *Aciers Fins et Speciaux Francais,* no. 5, June 5, 1950.)

Results of investigation of hardness and transformation effects are charted, tabulated, and discussed. (J2, Q29, CN, AY)

67-J. Some Cases of Application of Modern Heat Treatments to Spanish Special Steels. (In Spanish.) Manuel Torrado y Varela. *Instituto del Hierro y del Acero,* v. 3, Oct.-Dec. 1950, p. 309-322.

Heat treatments and resulting transformations and properties. Photomicrographs, charts, diagrams, tables, and photographs. 26 ref. (J general, N8, ST)

68-J. Are You Getting the Most From Your Water Sprays? W. P. Wallace and C. E. Manes, Jr. *Iron Age,* v. 169, Jan. 31, 1952, p. 112-114.

Speed of quenching with water sprays depends on droplet size and the breakdown of the insulating steam layer around the steel. Variables studied indicate water sprays can be used to greater advantage to promote deeper hardening. (J26, ST)

69-J. Charts Simplify Selection of Heat Treatable Steel. E. H. Stilwill. *Iron Age,* v. 169, Feb. 14, 1952, p. 130-133.

Selection of substitute steels is simplified by use of new metallurgical tables prepared by the Iron & Steel Technical Committee of the Society of Automotive Engineers. Tables take into account both section size and quenching medium to be used. They also differentiate between highly stressed parts requiring nearly an all-martensitic structure on the quench and those which do not have to be "quenched out." (J26, S22, ST)

70-J. Production Heat Treating. George Goepfert. *Steel,* v. 130, Feb. 11, 1952, p. 82-84, 112, 114.

Describes heat-treating procedure on steering-assembly parts generally made from SAE 8620 steel. All parts undergo one or more of three controlled-atmosphere processes — carburizing, cyaniding and clean hardening. (J2, J28, AY)

K

JOINING

130-K. Welding Turbine Shafts and Wheels for Jet Engines. George H. DeGroat. *Machinery* (American), v. 58, Jan. 1952, p. 179-183.

Methods employed at Wright Aeronautical Corp. to meet high-quality specifications. The wheels are made of 16-25-6 Cr-Ni-Mo steels and the shafts of low-alloy steel (0.70% Mn, 1.65-2.0% Ni). Electric-arc welding with a manual flux-coated electrode is used. (K1, SS)

131-K. Large Structures and Heavy Gauge Metals Joined at Ryan With Improved Spot Welding. *Western Metals,* v. 10, Jan. 1952, p. 37-38.

Equipment and procedures. Stainless steels and Al alloys are the principal metals involved. (K3, Al, SS)

132-K. Cold Pressure Welding. *Aero Digest,* v. 64, Jan. 1952, p. 69.

Method which doesn't require heat or electricity. Developed in England, the process is applicable to all nonferrous metals, particularly Al and its alloys. (K5, EG-a, Al)

133-K. Welding Iron-Bearing Alpha Aluminum Bronze. F. Emery Garriott. *Welding Journal,* v. 31, Jan. 1952, p. 18-28.

Tests show that iron-bearing alpha aluminum bronze sheet and plate can satisfactorily be fabricated by the various arc welding processes. Mechanical properties of the weld metal produced by any of these processes are comparable to those of the base metal. (K1, Q general, Cu)

134-K. Product Design for Welding. John Mikulak. *Welding Journal,* v. 31, Jan. 1952, p. 29-34.

Equipment and method for economical automatic welding of moderate quantities on production jobs. Graphs, diagrams, and illustrations. (K1)

135-K. Hints for Silver-Brazing of Stainless Steel. J. P. Emmerich. *Welding Journal,* v. 31, Jan. 1952, p. 50-53. (K8, SS)

136-K. Four at One Blow. *Welding Journal,* v. 31, Jan. 1952, p. 53.

A machine designed by the Thomson Welding Machine Co. that makes four simultaneous spot welds in production of jet-engine combustion chambers. (K3)

137-K. Predetermination of Preheat and Postheat for Submerged-Arc Welding. Clarence E. Jackson and Arthur E. Shrubsall. *Welding Journal,* v. 31, Jan. 1952, p. 1s-10s.

A comparison of the transformation of austenite with continuous cooling, and applications of controlled preheat and postheat treatments in welding alloy steels. Data are graphed. 11 ref. (K1, N8, AY)

138-K. Welding of High-Alloy Castings. R. David Thomas. *Welding Journal,* v. 31, Jan. 1952, p. 27s-32s.

A restrained test plate was devised for evaluation of the quality of welds in 15-35 Cr-Ni castings from the standpoint of freedom from cracks, fine fissures, and other forms of defects. Radiographic examination of the plates will only reveal major defects, but the existence of fine fissures can be determined by cross-sectioning the welds, polishing, and macro-etching. (K9, S13, SS)

139-K. Welded Continuous Frames. Plastic Design and the Deformation of Structures. P. S. Symonds. *Welding Journal,* v. 31, Jan. 1952, p. 33s-36s.

Discussion on the above paper published in July 1951 issue. See item 453-K, 1951. 11 ref. (K9, Q23, T26)

140-K. Stainless-Steel Weld Deposits on Mild and Alloy Steels. Helmut Thielsch. *Welding Journal,* v. 31, Jan. 1952, p. 37s-64s.

A review of published and unpublished information on dissimilar metal joints made with stainless steel electrodes: metallurgical characteristics of joints, dilution, mechanical properties, base steel and weld metal cracking, hardenable steels, and applications. 114 ref. (K1, Q general, SS, AY, CN)

141-K. Spot-Welding. *Aircraft Production,* v. 14, Jan. 1952, p. 5.

Semi-automatic equipment for welding gas-turbine combustion chambers. (K3)

142-K. Rubber-Metal Parts. H. H. Hile, E. E. Blaurock, and A. S. Miceli. *Machine Design,* v. 24, Jan. 1952, p. 142-147.

Information on bonding rubber to metal. Bond stresses, type of metals, tolerances, molds, the curing process, and size shrinkage. Diagrammed. (K11, ST, Ni, Al, Cu, Zn, CI)

143-K. The Fabrication of a Large Gear Guard. J. Floyd. *Sheet Metal Industries,* v. 29, Jan. 1952, p. 21-26.

Details of layout and welding of sheet-metal part. Schematic diagrams. (K1, G1, CN)

144-K. Processes Used in the Bonding of Metals by Means of Synthetic-Resin Adhesives. F. H. Parker. *Sheet Metal Industries,* v. 29, Jan. 1952, p. 63-68.

Equipment and procedures. (K12)

145-K. Industrial Brazing. E. V. Beatson and H. R. Brooker. *Welding and Metal Fabrication,* v. 20, Jan. 1952, p. 2-11.

Methods and equipment. (K8)

146-K. Heavy Fabrication at Redcar. *Welding and Metal Fabrication,* v. 20, Jan. 1952, p. 14-21.

The welding department at the Redcar Works of Dorman, Long & Co., Ltd., and the new fabrication shop. Details of the plant and some typical large weldments produced. (K general, A5)

147-K. Reclamation of Iron Castings by Reinforced Bronze Welding. G. G. Musted. *Welding and Metal Fabrication*, v. 20, Jan. 1952, p. 25-26.

Excellent results can be obtained in the repair and reclamation of defective iron castings intended for high pressures, using oxy-acetylene bronze welding on electric arc sealing runs, the castings being reinforced by steel studs and lengths of mild steel round bar. (K2, CI)

148-K. Welding of Large Aluminium Structures. Recent Researches on the Arc Welding of Thick Aluminium Alloy Plate. P. T. Houldcroft, W. G. Hull, and H. G. Taylor. **Practical Aspects of the Argonarc Welding of Aluminium Alloy.** J. R. Handforth. *Welding and Metal Fabrication*, v. 20, Jan. 1952, p. 27-34; disc., p. 35. (Condensations.)

Includes tables and diagrams. (K1, Al)

149-K. Spot Welding Results in Lighter Steel Structures. E. Gut. *Brown Boveri Review*, v. 38, July-Aug. 1951, p. 248.

Methods employed in the coach-building industry. (K3)

150-K. Investigation of Argon-Arc and Autogenous Welded Light-Metal Sheets. (In German.) K. Longard. *Metall*, v. 5, Dec. 1951, p. 538-539.

Results of hardness, tensile, and bending test are tabulated and charted. Photomicrographs show comparative weld microstructures. 99.5% Al and four Al alloys were tested. (K1, Q27, Q29, Q5, Al)

151-K. Free Flowing Temperature of Silver Solder. (In German.) O. Loebich. *Metall*, v. 5, Dec. 1951, p. 548-550.

Importance of finding the free-flowing temperature for the workpiece in order to assure quality soldering. (K7, Ag)

152-K. Control System for Induction Heaters. *Electronics*, v. 25, Feb. 1952, p. 194, 198, 202. (Condensed from "Induction Heater Control System," R. W. Ketchledge, *Bell System Technical Journal*, Sept. 1951.)

When silver soldering or brazing near rubber or plastic insulation, the operation should be completed as rapidly as possible to avoid damage to the insulation and to the parts being brazed or soldered. The control system described reduces the power when the desired temperature has been reached and disconnects the power when the braze is completed. (K8, S18)

153-K. Navy Investigates Weld Fracture Problems. *Industry & Welding*, v. 25, Feb. 1952, p. 39, 71.

Explosion-bulge testing of welds in heavy steel plate provides relatively low-cost method of evaluating structural performance and furnishes basic information needed for investigation of the weld-fracture problem. (K9, CN)

154-K. Automatic Submerged Arc Unit Speeds Production. *Industry & Welding*, v. 25, Feb. 1952, p. 35-36, 70-71.

Welding unit used for varied applications in manufacture of low-pressure firetube boilers, tanks, pressure vessels, etc., by Farrar & Trefts, Inc., Buffalo. (K1, CN)

155-K. How Welding Repaired 44 Cracks in Cast Steel. J. S. Walsh. *Industry & Welding*, v. 25, Feb. 1952, p. 44, 47, 73-74.

As applied to a 2500-ton press platen. (K general, CI)

156-K. Inert Arc Process Fabricates Aluminum Boxes 20 Percent Faster. *Industry & Welding*, v. 25, Feb. 1952, p. 68, 70-71.

The process and its advantages. It is applied to traffic-signal-control cabinets by Eagle Signal Corp., Moline, Ill. (K1, Al)

157-K. Controlled Spot Welds Improve Aircraft Production. Gilbert C. Close. *Industry & Welding*, v. 25, Feb. 1952, p. 50-52, 55, 88-90.

Work at Northrup Aircraft. Inspection procedures are emphasized. (K3, S13, Al)

158-K. Rotating Jigs Speed Welding. *Industry & Welding*, v, 25, Feb. 1952, p. 74.

Process at Boardman Co., Oklahoma City, where downhand welding of heavy steel equipment is facilitated by use of rotating jigs. (K1, ST)

159-K. The Cause and Cure of Troubles in Stainless and Alloy Welding. *Industry & Welding*, v. 25, Feb. 1952, p. 76-80.

Welding data in tabulated form under the headings trouble, cause, suggested correction. (K general, SS, AY)

160-K. Welding and Riveting Larger Structures. *Light Metals*, v. 15, Jan. 1952, p. 37-38.

Discusses four papers presented at a symposium of the Aluminium Development Assn. Confined to Al structures. (K general, Al)

161-K. Welding With Inert Gases. *Machine and Tool Blue Book*, v. 48, Feb. 1952, p. 109, 110, 112-114.

Advantages and applications. Current densities must be increased to 12 times that required for equivalent types of ordinary metal-arc welding. (K1)

162-K. Progress in the Welding Industry. B. Karnisky. *Metal Progress*, v. 61, Jan. 1952, p. 59-63.

Reviews some of the highlights of the past. Enumerates some of the basic problems still to be solved. (K general)

163-K. Engineering Uses for Rubber Adhesives. R. S. Piper. *Product Engineering*, v. 23, Feb. 1952, p. 130-133.

Application techniques and comparison of properties of various rubbers. Includes use for metal bonding. (K12)

164-K. Flux Bath Dip Brazing of Aluminum Alloys. D. Wallace. *Product Engineering*, v. 23, Feb. 1952, p. 173-175.

Properties and suitability of various Al alloys for brazing. Details of brazing process, stressing melting temperatures and mechanical properties of the filler and base metal. (K8, Al)

165-K. How to Get More Out of Resistance Welding Control. *Steel*, v. 130, Jan. 28, 1952, p. 68-69, 81.

Advantages of the ignitron for extending welding equipment to handle heavier loads. Data are charted; circuits diagrammed. (K3)

166-K. A Comparison of Heating Methods for Brazing. Part II. Lester F. Spencer. *Steel Processing*, v. 38, Jan. 1952, p. 29-34.

Various methods available in brazing of ferrous and nonferrous assemblies. Includes induction heating, torch, furnace, salt bath, radiant gas, and resistance brazing. (K8, Fe, ST)

167-K. Properties and Applications of Adhesives for Metals. (In French.) J. J. Meynis de Paulin. *Revue de l'Aluminium*, v. 28, Nov. 1951, p. 403-406.

Surface preparation, joint resistance, and behavior with water and solvents. A table sums up characteristics of the various bonding agents for metals and gives hints on their practical use. (K12)

168-K. Spot Welding of Semi-Hard Low Alloy Steel; Critical Study Concerning the Influence of Different Welding Parameters on the Quality of the Spots. (In French.) P. Joumat. *Soudure et Techniques connexes*, v. 5, Sept.-Oct. 1951, p. 224-232; Nov.-Dec. 1951, p. 267-276.

Influence of intensity and duration of different parameters on macrostructure and microstructure, as well as on certain mechanical properties of spot welds in steel plate were investigated. Part 2: Effects of regulation of tempering, preheating, and pressure. Results are shown graphically. Includes micrographs and macrographs. (K3, AY)

169-K. A Solution to the Problem of Semi-Automatic Welding Under Flux. (In French.) J. Petit. *Soudure et Techniques connexes*, v. 5, Nov.-Dec. 1951, p. 241-246; disc. 246-247.

A semi-automatic apparatus which makes it possible to have either continuous or discontinuous feeding of powder. Includes photographs. (K1)

170-K. Wire Soldering Fixture. W. M. Halliday. *Machinery*, (American), v. 58, Feb. 1952, p. 205-207.

Joint had to be made as strong as possible, but with the smallest amount of excess solder deposited around the joint. Material was steel. (K7, ST)

171-K. Fabricating a Large Welded Pipeline. T. G. Scott Field. *Machinery Lloyd* (Overseas Edition), v. 24, Jan. 9, 1952, p. 85-86.

Problems encountered. (K general, CN)

172-K. Carbon Steels Successfully Welded by Inert-Gas-Shielded Metal-Arc Process. H. T. Herbst and T. McElrath, Jr., *Materials & Methods*, v. 35, Feb. 1952, p. 86-87.

New argon-oxygen mixture containing approximately 5% O_2 and 95% A (marked at Linde argon-sigma grade), permits welding at high speeds without undercutting, improves coalescence of the weld metal at increased welding speeds, and provides good stability and low spatter rate. (K1, CN)

173-K. Longest, Largest Line Laid in Galveston Bay. Frank H. Love. *Petroleum Engineer*, v. 24, Feb. 1952, p. D3-D6.

Construction of pipeline, including coatings for protection against marine attack and welding procedure. (K general, L26, ST)

174-K. A Survey of Modern Theory on Welding and Weldability. (Continued). D. Serferian. *Sheet Metal Industries*, v. 29, Jan. 1952, p. 53-61.

Weldability of cast irons; oxy-acetylene welding of gray cast iron; arc welding of cast iron; and weld-brazing of steels and cast irons. Graphs and micrographs. (To be continued). (K9, CI, ST)

175-K. The Welding of the Wrought Light Alloys. *Transactions of the Institute of Welding*, v. 14, Oct. 1951, p. 169-172.

A discussion of papers on the above published in the Aug. 1951 issue. (K general, Al, Mg)

176-K. Recent Developments in Welding in Great Britain. *Transactions of the Institute of Welding*, v. 14, Oct. 1951, p. 173-176.

A discussion of papers published in the June 1951 issue. (K general)

177-K. Welding Jets at Solar Aircraft. Clyde B. Clason. *Welding Engineer*, v. 37, Feb. 1952, p. 17-21.

Conveyor-line assembly, inspection methods, materials and welding methods, including practically every major process, in use at new Solar plants. Most jet-engine parts are fabricated from 347 (Co-stabilized) stainless steel, Inconel and Inconel "X." (K general, SS, Ni)

178-K. Welding the High-Heat-Resistant Materials. J. L. Solomon. *Welding Engineer*, v. 37, Feb. 1952, p. 38-42.

Problems involved in welding alloys capable of withstanding service temperatures around 1800-1900° F. (K general, SG-h)

179-K. (Book) **Electronic Motor and Welder Controls.** George M. Chute. 347 pages. McGraw-Hill Book Co., 330 W. 42nd St., New York 18, N. Y.

Improved electrical circuits. Includes a variety of closed-cycle, motor-control systems. The stable op-

eration of such motors. (K1, K3)

180-K. (Book) **Werkstoff und Schweissung. Handbuch für die Werkstoff-und Werkstoffbedingte Verfahrenstechnik der Schweissung.** (Materials and Welding. Handbook on Materials and Techniques of Welding). Friedrich Erdmann-Jesnitzer. 1003 pages. 1951. Akademie-Verlag, 19 Schiffbauerdamm, Berlin, N.W. 7, Germany. 160 DM.

Covers the field of ferrous metals, including production, rolling, weldability and other properties of sheet steels, principles and special welding methods, and design of welded structures. Includes tables, graphs, diagrams, photographs, photomicrographs, and numerous references. (K general, ST)

L

CLEANING, COATING AND FINISHING

123-L. Fast Economical Descaling by Use of Induction Heat. Homer Kincaid. *Automotive Industries,* v. 106, Jan. 15, 1952, p. 43, 98.

Results of the process for removal of surface scale from metal parts after heat treatment. Theory is discussed. (L10, ST)

124-L. Fishscale Susceptibility of Enamel-Steel Systems. Donald C. Bowman. *Better Enameling,* v. 23, Jan. 1952, p. 6-11.

See abstract from *Ceramic Industry;* item 52-L, 1952. (L27, CN)

125-L. Development of Fused Metallized Coatings. Harrison S. Sayre. *Welding Journal,* v. 31, Jan. 1952, p. 35-39.

A review of investigations conducted in the development of materials, techniques, and procedures for the application of hard overlays in the form of sprayed metal coatings remelted and fused by the oxyacetylene torch. (L23, L24)

126-L. Aluminum Electroplated on Steel From Fused Salt Bath. F. R. Collins. *Iron Age,* v. 169, Jan. 17, 1952, p. 100-101.

Al has been successfully electroplated on steel from a fused $AlCl_3$-NaCl salt bath. The plate is uniform and no interfacial layer of Fe-Al alloy occurs. Coated steels show high resistance to rusting in industrial, seacoast and humid atmospheres. Coating is free of continuous pores. Photomicrographs. (L17, Al, ST)

127-L. Induction Heat Cuts Descaling Costs. *Iron Age,* v. 169, Jan. 17, 1952, p. 106.

Method at Farmall Works of International Harvester whereby steel bars move automatically from furnace to inductor where heat rapidly expands scale which breaks off. The scale collects around left side of inductor and falls to receptacle. Water spray after quench aids operation. (L10, ST)

128-L. The Influence of Spraying Conditions on the Grain Size of Sprayed Metal Deposits. P. Koch. (Translated and condensed.) *Engineers' Digest,* v. 12, Dec. 1951, p. 406-407, 416.

Previously abstracted from *Metalloberfläche.* See item 805-L, 1951. (L23)

129-L. Newly Developed Electrolytic Iron Builds up Worn Bearing Surfaces. *Western Metals,* v. 10, Jan. 1952, p. 31-32.

"Vanderloy M" process for reclamation of such items as power and compressor cylinders, crankshafts, and the like. Vanderloy M is an iron which is electrodeposited in a fine columnar structure perpendicular to the base metal. Hard Cr is often applied in a thin layer on top of the Fe deposit. (L17, Fe, ST)

130-L. X-Ray Study of the Reactions at the Steel Surface When Titania Enamel Is Applied Directly. Gordon S. Douglas and Jason M. Zander. *Journal of the American Ceramic Society,* v. 35, Jan. 1, 1952, p. 5-11.

Detailed X-ray diffraction study of reactions during firing of a titania enamel directly on steel. The theory that adherence depends on presence of an oxidizing agent in the enamel adjacent to the steel was applied and a correlation obtained on the assumption that dissolved TiO_2 is the adherence-promoting oxidizing agent. (L27, ST)

131-L. Islanding—A Surface Characteristic of Some Porcelain Enamels. M. K. Blanchard and W. A. Deringer. *Journal of the American Ceramic Society,* v. 35, Jan. 1, 1952, p. 12-15.

Appearance and characteristics of islanded enamel surfaces. Possible modes of formation. Results of corrosion tests on islanded and nonislanded surfaces show the nonhomogeneity of some porcelain enamels. (L27, R general, ST)

132-L. Laboratory Tests Select Best Blast Cleaning Method. Eugene F. Anderson. *Steel,* v. 130, Jan. 21, 1952, p. 62-65.

Airless blast equipment and procedures designed for various types of parts. (L10)

133-L. Tin Plating Advances Save Metal. *Steel,* v. 130, Jan. 1952, p. 66-67. (Based on paper by C. T. Kunze and A. R. Wiley).

Method for measuring tinplate coating developed at research dept., American Can Co., is based on the fact that anodic dissolution of tin coatings on steel proceeds with full current efficiency in HCl enabling the coating weight of a defined area to be calculated by Faraday's law. Sn-Zn and Sn-Ni plating-bath compositions are given. (L17, Sn, Zn, Ni)

134-L. Clad Steel Bullet Jackets Conserve Copper and Zinc. E. J. Reardon. *Steel,* v. 130, Jan. 21, 1952, p. 68-69.

New-type welded angle cladding method which produces 2000-3000 lb. 17-in. wide billets and raises yield of usable clad strip. Many thicknesses are possible. 90-10 Cu-Zn or 80-20 Cu-Ni cladding is applied to steel strip used for making the bullet jackets, formerly entirely made from above alloys. (L22, CN, Cu)

135-L. Iron Plating Restores Worn Parts. Russell Pyles. *Iron and Steel Engineer,* v. 29, Jan. 1952, p. 151-152.

Electrolytic plating of iron called "Vanderloy M". Work is being conducted to adapt the bath to alloy plating. (L17, Fe)

136-L. Ceramics Investigation; The Effect of Ceramic Coated Alloys at Elevated Temperatures. Wilson G. Hubbell. *Western Machinery and Steel World,* v. 43, Jan. 1952, p. 82-85.

A series of tests conducted with ceramic coated exhaust system components show that the ceramic provides the protection necessary to extend the life of 19-9DL stainless steel at elevated temperatures encountered in aircraft service. Micrographs. (L27, SS)

137-L. New Trends in the Chemistry of Barrel Finishing. William E. Brandt. *Products Finishing,* v. 16, Jan. 1952, p. 24, 26, 28, 30.

Selection of a cleaner depends on the purpose of the operation and the particular metal processed. (L10)

138-L. Fitting Vapor Degreasers to the Job. Gilbert C. Close. *Products Finishing,* v. 16, Jan. 1952, p. 32-34, 36, 38.

Factors to be considered. (L12)

139-L. Hot Lacquer Provides Finish for Dental Equipment. Ezra A. Blount. *Products Finishing,* v. 16, Jan. 1952, p. 41-44.

Finishing operations on parts fabricated from cast Al, cast iron, and steel stampings. Advantages of the hot-lacquer spray process. (L26, Al, CI, ST)

140-L. Spotlighting Finishing Progress. Allen G. Gray. *Products Finishing,* v. 16, Jan. 1952, p. 46, 48, 50, 52, 54, 56, 58, 60, 62, 66, 68, 72, 74, 76, 78, 80.

Some recent contributions on electrochemical and chemical coatings for aluminum; lacquers for finishing military products; mechanism of paint blistering in sea water; corrosion resistance of anodized titanium; and acid recovery in continuous strip pickling. (L general)

141-L. Considerations in the Use of Infrared Heating for Drying Organic Coatings on Die Castings. *Precision Metal Molding,* v. 10, Jan. 1952, p. 46-47.

This process allows very low or very high rates of air flow past the work, as may be desired, without affecting the actual temperature of the work. (L26)

142-L. The Deposition of H. F. Crystal Electrodes by Vacuum Coating. L. Holland. *Electronic Engineering,* v. 24, Jan. 1952, p. 10-13.

The present method of frequency adjusting h.f. crystals by combined cathodic sputtering and electroplating techniques can be largely replaced by the single operation of evaporation coating. Details of apparatus. Emphasis is on application of gold and other precious metals onto quartz crystals. (L25, Au, EG-c)

143-L. Protective Finishes. Part 1. Finishes and Undercoating. Norman P. Gentieu. *Machine Design,* v. 24, Jan. 1952, p. 108-114, 196, 198.

Inorganic films formed on metals for the purposes of coloring, rust or corrosion proofing, wear resistance, protecting rubbing surfaces, or improving joint adhesion. Reaction equations, tables giving military finish specifications and protective-finish and corrosion-resistance data. (L general, ST, Al, Zn)

144-L. Metal Finishing Developments in 1951. Walter A. Raymond. *Metal Finishing,* v. 50, Jan. 1952, p. 50-56.

102 references. (L general)

145-L. Successful Hard Chrome Plating; The Story of Nutmeg Chrome Corp. *Metal Finishing,* v. 50, Jan. 1952, p. 58-59, 70.

Illustrated description of plant in Hartford, Conn. (L17, Cr)

146-L. Dragout Control. Part III. Joseph B. Kushner. *Metal Finishing,* v. 50, Jan. 1952, p. 60-64, 74.

Methods for recovery of dragout losses from plating tanks. 11 ref. (L17)

147-L. Insulation for Plating Racks. J. A. Williams. *Metal Finishing,* v. 50, Jan. 1952, p. 65-70.

Advantages and disadvantages of rubber, wax, and resin. Application and maintenance problems. (L17)

148-L. Calculating Metal Cost for Palladium Plating. *Metal Finishing,* v. 50, Jan. 1952, p. 81.

A chart. (L17, Pd)

149-L. Basic Principles of the Pickling and Etching of Steels and Their Application to the Production of Stainless Steel Sheet. H. E. Zentler-Gordon. *Sheet Metal Industries,* v. 29, Jan. 1952, p. 5-10, 16.

Includes graphs and illustrations of equipment. (L12, ST, SS)

150-L. Stripping of Electrodeposits. R. H. Keller. *Defense Research Laboratories, Commonwealth of Australia,* Information Circular 16, Sept. 1951, 23 pages.

Published methods for stripping brass, bronze, Cd, Cr, Cu, Au, Pb, Ni, Pd, Pt, Rh, Ag, Sn, Zn, and speculum from the base metals upon which they are usually plated. (L12)

151-L. Chromizing, a Process Effecting Metals Savings. (In German.) H. Kalpers. *Metall,* v. 5, Dec. 1951, p. 546-548.

The chromizing process and its application in industry. Possibilities for use of chromized iron and wood screws, rather than alloy steels. (L15, ST)

152-L. Zinc Plating in Acid Baths; A Review of the Journal and Patent Literature. (In German.) Richard Springer. *Metalloberfläche,* ser. B, v. 3, Oct. 1951, p. B148-B154; Nov. 1951, p. B168-B169.

80 references. (L17, Zn)

153-L. The Influence of Rectified Current Alternations Upon the Growth of Electrodeposits. (In German.) Max Ed. Beckmann and Friedrich Maass-Graefe. *Metalloberfläche,* ser. A, v. 5, Nov. 1951, p. A161-A169.

Zn, Cu, Ni, and Cr deposits from various electroplating baths. In most cases, no change of the deposit was effected by changing the alternation curve of the rectified current. Data are tabulated; graphs illustrate the results. (L17, Sn, Cu, Ni, Cr)

154-L. Investigation of the Spraying of Zinc Through Ferrous Tubing at Increasing Wall Temperatures. (In German.) Otto Van Rossum. *Metalloberfläche,* ser. A, v. 5, Nov. 1951, A172.

The tubing is used for conduction of acetylene gas in the spray process. Possibility of causing decomposition of the acetylene at the temperatures encountered (up to 142° C.) is believed to represent a serious hazard. (L23, Zn, ST)

155-L. Electroplating of Fine Zinc Alloys. (In German.) K. Löhberg and H. Nann. *Metalloberfläche,* ser. B, v. 3, Nov. 1951, p. B161-B165.

Practical procedure, with emphasis on Cu plating, including recommended surface-preparation procedure. Micrographs and photographs. (L17, Cu, Zn)

156-L. Influence of Certain Technological Factors on Smoothness of Burnished Surfaces. (In Russian.) D. M. Tarasenko. *Stanki i Instrument,* v. 22, Apr. 1951, p. 25-26.

An experimental study was made for five steels. Data are tabulated and charted. (L10, ST)

157-L. New Electrolytes for Tinning. (In Russian.) V. I. Sotnikova and M. A. Loshkarev. *Zhurnal Prikladnoi Khimii,* v. 24, Apr. 1951, p. 361-372.

The throwing power of H_2SO_4 tin plating baths with various additions was studied. The porosity of the cathodic deposit for the same conditions was measured. Data are tabulated. 14 ref. (L17, Sn)

158-L. Protection of Articles From Corrosion by Cold Phosphating Methods. (In Russian.) V. S. Lapatukhin. *Zhurnal Prikladnoi Khimii,* v. 24, Apr. 1951, p. 373-382.

See abstract from *Chemical Age;* item 630-L, 1951. (L14)

159-L. Study on Liquid Honing. I. (In Japanese.) Hidehiko Takeyama. *Journal of Mechanical Laboratory,* v. 5, July 1951, p. 111-114.

Possibility of vapor blasting with modified sandblasting equipment. Need for an improved nozzle is indicated. Experimental results and a fundamental equation for blasting of ductile materials such as mild steel. Diagrams and graphs. (L10, CN)

160-L. Study of Abrasives. I-IV. (In Japanese.) Wataru Funahashi. *Journal of Mechanical Laboratory,* v. 5, Aug. 1951, p. 176-182; Sept. 1951, p. 192-197.

Part I: Microstructure of Japanese-produced abrasives made from quartzite. Part II: Use for polishing of Cu electrodeposits. Part III: Use for Ag elctrodeposits. Part IV: Use for Ni, Cu, Al, brass, and "Almite" electrodeposits. Graphs, tables and micrographs. (L10, Cu, Al, Ni)

161-L. Recent Ceramic Coatings for High-Temperature Alloys. *Ceramic Age*, v. 59, Jan. 1952, p. 29-30.

Various types of ceramic coatings developed by National Bureau of Standards and applications. (L27)

162-L. Determines Water in Frit is the Main Source of Hydrogen Defects. *Ceramic Industry*, v. 58, Feb. 1952, p. 65.

See abstract of "Relative Importance of Various Sources of Defect-Producing Hydrogen Introduced into Steel During the Application of Porcelain Enamel," *Journal of the American Ceramic Society:* item 168-L, 1952. (L27, ST)

163-L. Use Inhibitors to Help Conserve Pickle Acids. Paul A. Huppert. *Ceramic Industry*, v. 58, Feb. 1952, p. 61-62.

How inhibitors work and their advantages for enamelers, a few of which are metal conservation, smoother metal surfaces at less cost, and elimination of over-pickling. (L12, ST)

164-L. Vanderloy M. *Diesel Power and Diesel Transportation*, v. 29, Dec. 1951, p. 44-47.

Process of iron deposition for repair of worn parts. (L22, Fe)

165-L. Surfacing by Arc Welding. Gorham Woods. *Industry & Welding*, v. 25, Feb. 1952, p. 58-59, 61, 63, 64-67, 98-99.

Abrasive wear. Recommends various carbides and other wear resistant materials for the surfacing electrodes. (L24, T5, C-n)

166-L. Properties of Alloy Steels for High Temperature Service. III. (Concluded). *Industrial Heating*, v. 19, Jan. 1952, p. 82, 84, 86.

Includes a condensed version of "Cladding of Molybdenum for Service in Air at Elevated Temperature" W. L. Bruckart and R. L. Jaffee, previously abstracted from *American Society for Metals*, Preprint 18, 1951. See item 626-L, 1951. (L24, Mo)

167-L. Control Addition Agent Vital in Lead-Tin Plating. J. B. Mohler. *Iron Age*, v. 169, Feb. 7, 1952, p. 139-141.

Small amounts of Cu, Sb or As increase strength and fatigue resistance. Gelatin or glue in the bath give a fine-grained deposit. Resorcinol minimizes change in deposit composition; best determined by a bromination method. 10 ref. (L17, S11, Pb, Sn)

168-L. Relative Importance of Various Sources of Defect-Producing Hydrogen Introduced Into Steel During the Application of Porcelain Enamels. Dwight G. Moore, Mary A. Mason, and William N. Harrison. *Journal of the American Ceramic Society*, v. 35, Feb. 1, 1952, p. 33-41.

Deuterium was used to trace the source of defect-producing hydrogen in steel. The deuterium was introduced, in turn, as a replacement for protium in the pickling acid, the milling water, the quenching water, the chemically combined water in the clay, and the dissolved water in the frit. The gases evolved during fishscaling of the coated steel specimens from each experiment were collected and analyzed for deuterium and protium with the mass spectrometer. 20 ref. (L27, ST)

169-L. Hydrophobic Films on Solid Surfaces. George J. Kahan. *Journal of Colloid Science*, v. 6, Dec. 1951, p. 571-575.

Experiments on hydrophobic films and monolayers on metal and glass. Film formation was obtained on metals with both cationic and anionic surface-active compounds; on glass, it was obtained only with cationic wetting agents. (L general)

170-L. Stress Reduction of Electrodeposited Nickel. Vincent J. Marchese. *Journal of the Electrochemical Society*, v. 99, Feb. 1952, p. 39-43.

Tests were conducted to investigate possibilities of electroforming low-stress Ni microwave plumbing. Two methods were studied: use of saccharin as an addition agent in a standard Watts bath, and superposition of a.c. on d.c. Results are tabulated and diagrammed. 12 ref. (L18, Q25, Ni)

171-L. Electrodeposition of Rhenium-Cobalt and Rhenium-Iron Alloys. L. E. Netherton and M. L. Holt. *Journal of the Electrochemical Society*, v. 99, Feb. 1952, p. 44-47.

Suitable conditions for using an ammoniacal citrate plating bath. The effects of bath composition, pH temperature, and current density on cathode current efficiency and composition of the alloy deposit. (L17, Re, Co, Fe)

172-L. The Electrodeposition of Cobalt-Tungsten-Molybdenum Alloys From Aqueous Citrate Solutions. R. F. McElwee and M. L. Holt. *Journal of the Electrochemical Society*, v. 99, Feb. 1952, p. 48-52.

Experimental procedure and results. (L17, Co, W, Mo)

173-L. Electroforming Aluminum Waveguides Using Organo-Aluminum Plating Baths. W. H. Safranek, W. C. Schickner, and C. L. Faust. *Journal of the Electrochemical Society*, v. 99, Feb. 1952, p. 53-59.

Al waveguides with twists, bends, and tapers were electroformed by electrodepositing Al on electropolished, Cu-plated, Cd-Ni alloy mandrels, followed by melting out the Cd-Ni alloy and dissolving out the Cu in HNO_3 solution. This is a new procedure for obtaining mirror-like inner surfaces on electroformed articles. 80 ref. (L18, Al, Cu, Cd, Ni)

174-L. The Effect of Indium Sulfate in Chromium Plating Baths. Norman Hackerman and Tyleen Jensen. *Journal of the Electrochemical Society*, v. 99, Feb. 1952, p. 60-63.

Addition of indium sulfate to the regular 100-to-1 Cr plating bath permitted the formation of a bright electrodeposit at 32° C. at current densities considerably above the accepted bright plating range. The deposit was more nearly crack-free than that usually formed and it was a better protective coating according to a salt-drop test. It was more adherent both to steel and to Cu than deposits formed from the regular bath in the bright range. Photomicrographs. (L17, Cr, ST)

175-L. Cathode Polarization Potential During Electrodeposition of Copper. II. Variation of the Cathode Polarization Potentials With Current Density and Electrolyte Concentration. L. L. Shreir and J. W. Smith. *Journal of the Electrochemical Society*, v. 99, Feb. 1952, p. 64-70.

Experimental procedure and results. Data are graphed and tabulated. (L17, C23, Cu)

176-L. The Effect of Chloride Ions on Copper Deposition. W. H. Gauvin and C. A. Winkler. *Journal of the Electrochemical Society*, v. 99, Feb. 1952, p. 71-77.

Results of investigation. Data are graphed and tabulated. 26 ref. (L17, Cu)

177-L. Concentration Polarization During Copper Deposition in a Convection-Free System. R. C. Turner and C. A. Winkler. *Journal of the Electrochemical Society*, v. 99, Feb. 1952, p. 78-83.

Procedure and results. Tables, diagrams, graphs, and illustrations. 14 ref. (L17, C23, Cu)

178-L. The Effects of Halides on Copper Deposition in the Presence of Gelatin. L. Mandelcorn, W. B. McConnell, W. Gauvin, and C. A. Winkler. *Journal of the Electrochemical Society*, v. 99, Feb. 1952, p. 84-88.

Results of the investigation. Graphs. 11 ref. (L17, C23, Cu)

179-L. Bearings and the Electrodepositor. O. Wright. *Journal of the Electrodepositors' Technical Society*, v. 25, 1949-50, p. 51-64.

The requirements of bimetallic bearings. Casting of these bearings and the electrodeposition techniques used. Various compositions. 23 ref. (L17, T7, SG-c)

180-L. The Influence of Surface Behaviour on the Characteristics of Electrodeposits. A. T. Steer. *Journal of the Electrodepositors' Technical Society*, v. 25, 1949-50, p. 125-146.

Fundamental principles, including the problem of examining surfaces and deposits; the mechanism of crystal growth; conditions present in metal surfaces before and after polishing; and influence of surface state on electrodeposition. Results of experiments on electrodeposition of Ni on nickel silver (12.5% Ni). Micrographs. (L17, M27, Ni, Cu)

181-L. Metal Spraying. A. R. Old. *Journal of the Oil and Colour Chemists' Association*, v. 35, Jan. 1952, p. 20-24; disc., p. 24-27.

The metal spraying process, its scope and applications. Certain practical points are mentioned with special reference to the paint industry. Value in corrosion protection, reclamation of worn parts, and decoration. (L23, ST)

182-L. Butyl Titanate in Heat Resisting Aluminium Paints. A. Hancock, and R. Sidlow. *Journal of the Oil and Colour Chemists' Association*, v. 35, Jan. 1952, p. 28-39.

The physical and chemical properties of butyl titanate. Properly formulated butyl titanate aluminum paints, when applied to steel and burned off, leave films of TiO_2 and Al which are very adherent and withstand high temperatures for a long time. (L26, Al, ST)

183-L. Araldite Surface Coating for Light Metals. P. A. Dunn. *Light Metals*, v. 15, Jan. 1952, p. 38-40.

Advantages and methods of application of the ethoxylene-resin-base lacquers for the protection of aluminum, magnesium and their alloys. (L26, Al, Mg)

184-L. Silicone Coatings Protect Metals Against Severe Service Conditions. C. E. Arnitzen and R. D. Rowley. *Materials & Methods*, v. 35, Jan. 1952, p. 82-84.

Silicone coatings with respect to heat resistance, weathering, chemical resistance, and applications. (L26)

185-L. Induction Descaling Proves a Fast, Economical Method for Cleaning Steel. Homer Kincaid. *Materials & Methods*, v. 35, Jan. 1952, p. 97.

Advantages and limitations of the process. (L10, ST)

186-L. Photographic Reproduction on Anodized Aluminium. N. I. Kirillov and A. S. Kheynman. *Metal Industry*, v. 80, Jan. 11, 1952, p. 31-33. (Translated from *Zhurnal Prikladnoi Khimii).*

Details of method by which anodic films can be made light-sensitive. (L19, Al)

187-L. Metal Cleaning and Finishing Since the War. Vernon A. Lamb. *Metal Progress*, v. 61, Jan. 1952, p. 76-80.

Progress in fundamental research and in applied and developmental work. (L general)

188-L. Technique Used in Cleaning, Coating, Printing Down Etching and Finishing Magnesium Photoengraved Plates. E. R. Owen. *Printing Equipment Engineer*, v. 82, Jan. 1952, p. 20. (L12, L26, Mg)

189-L. Phosphatizing—Versatile Substitute for Metallic Coatings. *Steel*, v. 130, Jan. 28, 1952, p. 64-66.

Advantages and applications of phosphate coatings. Includes use in wire drawing, extrusion, and other working operations. (L14, F1, ST)

190-L. Felt for Finishing: Metalworking Applications Expand. Leon D.

Gruberg. *Steel,* v. 130, Feb. 4, 1952, p. 88-89, 110.

The use of felt in metalworking. Refers to cleaning, polishing, and finishing of Cr plated parts, Al, Cu, and stainless steel. Process of making, care, and use of felt wheels. (L10, Al, Cu, SS)

191-L. Differential Coated Electrolytic Tin Plate. J. J. Munns. *Steel Equipment & Maintenance News,* v. 5, Jan. 1952, p. 12-13.

See abstract in *Steel;* item 57-L, 1952. (L17, Sn, ST)

192-L. Variations As a Function of Temperature and of Applied Potential of the Electrical Resistance of Very Thin Metallic Deposits on Diamond, Amber, and Plexiglas. (In French.) Nicolas Mostovetch and Thérese Duhautois. *Comptes Rendus hebdomadaires des Séances de l'Académie des Sciences,* v. 233, Nov. 19, 1951, p. 1265-1267.

Electrical behavior of very thin metallic films vapor-deposited on above materials. Such films have semiconducting properties independent of the nature of the base. (L25, P15)

193-L. Recent Applications of the Technique of High-Vacuum Vapor Deposition As a Means of Metallizing Plastic Materials. (In German.) L. Hiesinger. *Kunststoffe,* v. 41, Dec. 1951, p. 444-446.

Equipment, procedure, and uses. Includes tabulated data. (L25)

194-L. Cleaning of Castings and Removing Scale By a Continuous Process Without Compressed Air. (In German.) H. Kalpers. *Sprechsaal für Keramik; Glas; Email,* v. 84, Dec. 5, 1951, p. 471-472.

Two new pieces of equipment. (L10)

195-L. Anticorrosion-Decorative Nitriding. (In Russian.) Ia. A. Shliamberg. *Legkaya Promyshlennost,* v. 11, Apr. 1951, p. 39-41.

Treatment of various steel articles as a means of conserving nonferrous metals. (L15, ST)

196-L. Method of Descaling Metallic Pieces by Means of Sodium Hydride. (In Spanish.) N. H. Gilbert. *Instituto del Hierro y del Acero,* v. 4, Apr.-June 1951, p. 182-186.

Method developed by E. I. du Pont de Nemours & Co. (L12)

197-L. Fundamentals of Aluminum Paint. Ernest Scheller. *American Paint Journal,* v. 36, Feb. 18, 1952, p. 82, 84-85, 88-89, 92-93.

Theories, fundamentals, and functions of Al paint. The pigment and its behavior in the varnish, lacquer, or synthetic solution. (L26, T29, Al)

198-L. The Cleaning of Metals in Engineering Processes. I. B. McKenzie. *Australasian Engineer,* Dec. 7, 1951, p. 87-93.

Various mechanical and chemical methods for cleaning metals. Stresses ferrous materials. Tabulated classification of cleaning methods. 33 ref. (L10, L12, Fe)

199-L. Silicone Paint Protects High Temperature Refinery Equipment. Max Leavenworth. *Corrosion* (New Section), v. 8, Feb. 1952, p. 1. (L26, SG-h)

200-L. Improving the Corrosion Resistance of Metal Surfaces. Allen L. Alexander. *Electrical Manufacturing,* v. 49, Feb. 1952, p. 112-115, 258, 260, 262, 264, 266, 268.

Techniques of preconditioning metal surfaces prior to application of organic finishes. (L26)

201-L. Purification of Plating Solutions by Low Current Density Electrolysis. C. E. Naylor. *Electroplating and Metal Finishing,* v. 5, Jan. 1952, p. 7-10.

See abstract from *Plating Notes;* item 795-L, 1951. (L17)

202-L. Chromium Plating. *Electroplating and Metal Finishing,* v. 5, Jan. 1952, p. 11-14.

Reviews development. (L17, Cr)

203-L. The Scope of Metal Spraying. H. J. Plaster. *Electroplating and Metal Finishing,* v. 5, Jan. 1952, p. 33-36.

The wire process of metal spraying. Included are decorative metal spraying, spraying electrical appliances and die castings. (L23)

204-L. Seven Barrels Bright Hone or Deburr 110 Different Parts. Floyd Hubbard. *Finish,* v. 9, Feb. 1952, p. 27-29, 64.

Components include stampings, castings, forgings, and screw machine products made from steel, brass, stainless, zinc, and aluminum alloys. One man operates the entire set-up. (L10, ST, Cu, SS, Zn, Al)

205-L. Metallizing Cuts Marine Maintenance Costs. Fred M. Earle. *Iron Age,* v. 169, Jan. 31, 1952, p. 103-105.

How Al and Zn sprayed on properly cleaned iron and steel and coated with vinyl sealers are effectively protecting steel fishing boats from salt-spray corrosion. Maintenance costs are lower. Entire envelopes of ships are being sprayed during construction to protect steel hull and deck plates. (L23, ST, Al, Zn)

206-L. The Anodic Oxidation of Aluminum in Liquid Ammonia. William E. Bennett, Arthur W. Davidson and Jacob Kleinberg. *Journal of the American Chemical Society,* v. 74, Feb. 5, 1952, p. 732-735.

The behavior of Al as anode in a variety of electrolytes in liquid NH_3. Low initial valence numbers were observed only when the electrolyte contained the readily reducible nitrate ion. (L19, Al)

207-L. The Anodic Oxidation of Higher Members of the Aluminum Family in Liquid Ammonia. Albert D. McElroy, Jacob Kleinberg and Arthur W. Davidson. *Journal of the American Chemical Society,* v. 74, Feb. 5, 1952, p. 736-739.

Results of studies on Ga, In and Tl. (L19, Ga, In, Tl)

208-L. Power Brush Finishing. V. K. Charvat and R. C. Sasena. *Machine Design,* v. 24, Feb. 1952, p. 112-121.

Application of power-driven brushes to obtain unusual or more refined surface finishes. Includes a table of design factors for brushes and brushing machines. (L10)

209-L. Protective Finishes; Phosphate Coatings for Military Equipment. Part 2. Rustproofing and Protecting Friction Surfaces. Norman P. Gentieu. *Machine Design,* v. 24, Feb. 1952, p. 141-145, 222.

Finishes such as Mn and Zn phosphates and their applications in military equipment. (L14)

210-L. Copper-Clad Aluminum Can Conserve Copper in Many Uses. John L. Everhart. *Materials & Methods,* v. 35, Feb. 1952, p. 82-85

Mechanical and physical properties of Cu-clad Al. Fabrication, annealing, and joining. Various applications are given. (L22, Cu, Al)

211-L. New Protective Treatment for Aluminum Simplifies Processing at Reduced Costs. R. Stricklen. *Materials & Methods,* v. 35, Feb. 1952, p. 91-95.

General properties of Iridite #14 (Al-Coat), a chromate process for Al developed by Allied Research Products, Inc. Includes data on corrosion resistance, electrical properties, and weldability of the treated Al. Micrographs and tables. (L14, R general, P15, K9, Al)

212-L. Surface Treatment and Plating in Naval Aircraft. Gordon S. Mustin. *Metal Finishing,* v. 50, Feb. 1952, p. 53-61, 73.

Specifications most likely to be encountered in naval aircraft work. Materials include high-strength Al alloys and various types of steel. 55 ref. (L general, Al, ST)

213-L. Report of British Metal Finishing Productivity Team on British vs. American Practices. *Metal Finishing,* v. 50, Feb. 1952, p. 62-64, 73.

Conclusions and recommendations. (L general)

214-L. Heavy Immersion Tin Plating. J. K. Wilson and O. Wright. *Metal Finishing,* v. 50, Feb. 1952, p. 69-70.

Previously abstracted from "Contact Tin Plating With a Difference," *Electroplating* and *Metal Finishing.* See item 695-L, 1951. (L16, Fe, AY, Cu, Sn)

215-L. Evaluating Metal Cleaning Efficiency. Samuel Spring. *Metal Finishing,* v. 50, Feb. 1952, p. 65-68.

Use of the water spray pattern for evaluation of partially soiled surfaces, especially as a laboratory method, although it is adaptable to plant usage. (L12)

216-L. Calculating Metal Cost for Platinum Plating. *Metal Finishing,* v. 50, Feb. 1952, p. 78.

A chart. The example shown is for calculating the cost of plating 0.006 in. of Pt on a surface area of 5 sq. ft. Lighter or heavier coatings than shown in the table can be calculated using appropriate factors. (L17, Pt)

217-L. Colourless Lacquers as Plating Reinforcements. *Metal Industry,* v. 80, Jan. 25, 1952, p. 67-69.

A discussion given by the Midlands Centre of the Institute of Metal Finishing on lacquers for protecting plated surfaces, particularly Cr plate. (L26, Cr)

218-L. Cladding of Metals. R. D. Weber. *Metallurgia,* v. 45, Jan. 1952, p. 3-6.

The principles of metal cladding, methods and processes used, and techniques of solid-phase bonding. Liquid-phase cladding, by means of continuous casting, and scrap recovery of clad metals. 10 ref. (L22)

219-L. The Protection of Metallic Surfaces by Chromium Diffusion. Part VI. Applications of Chromising. R. L. Samuel and N. A. Lockington. *Metal Treatment and Drop Forging,* v. 19, Jan. 1952, p. 27-32.

Economics of the chromizing process; efficiency of method and equipment; shape and nature of component; and processing sequence. Typical examples are of application of the process to impart corrosion and heat resistance to various steels. A combined Cr-Si-Al diffusion treatment and its potentialities. (To be continued.) (L15, ST)

220-L. Finishing Parker Pens. Thomas H. Laken. *Plating,* v. 39, Feb. 1952, p. 149-151.

Includes buffing, deburring, plating, etc. (L10, L17)

221-L. Current and Metal Distribution in Electrodeposition. II. Theoretical Considerations. John Kronsbein. *Plating,* v. 39, Feb. 1952, p. 165-170.

An elementary description of some underlying quantitative principles. Some known cases of uniform current and metal distribution and results of theoretical investigations into distribution on flat sheets and on angles. (L17)

222-L. Ceramics, Welding, Bonding Are Topics of Processing Panel. H. W. Ingalls. *SAE Journal,* v. 60, Feb. 1952, p. 28-29, 38.

Reports on a panel discussion on processing of aircraft materials held at SAE National Aeronautic Meeting, Los Angeles, Oct. 2, 1951. Ceramic coatings, welding, and metal bonding. (L27, K general, SG-h)

223-L. Paint Protection of Sewage Works Structures. W. T. McClenahan. *Sewage and Industrial Wastes,* v. 24, Jan. 1952, p. 1-23.

The various types of protective coatings available and suitable for metals used in and about sewage works. (L26)

224-L. The Mechanical Surface Finishing of Metals. G. T. Colegate. *Sheet Metal Industries,* v. 29, Jan. 1952, p. 71-78, 82; Feb. 1952, p. 163-172.

First installment of a series in which the methods considered will form part of a sequence, the final stage of which is electrodeposition, coloring, or some other form of chemical or electrochemical treatment such as anodizing. Part 1: Polishing. Part 2: The effect of various factors on ease of polishing. (To be continued.) (L10)

225-L. Electrode Deposit Fights Wear. *Steel,* v. 130, Feb. 11, 1952, p. 85.

How a tough, friction-resistant surface is applied to worn uncoiler-cone adapters by a weld-deposition procedure. This extends life by a year. Illustrated. (L24, ST)

226-L. For Better Finishes Clean Aluminum Thoroughly. *Steel,* v. 130, Feb. 11, 1952, p. 88-90, 92.

Several effective methods for cleaning Al and its alloys. Importance of good cleaning practice. (L12, Al)

227-L. (Book) **Handbuch der Metallbeizerei.** (Handbook of Metal Pickling). I. Nonferrous Metals. O. Vogel. 410 pages. 1951. Verlag Chemie, GmbH, Weinheim/Bergstrasse, Germany. 49.20 DM.

First part deals with general matters such as development of metal pickling, work layout and equipment, acid storage, disposal and treatment of waste pickle liquors, health problems involved, occupational diseases, and first-aid treatment. Second part deals with preparation for pickling and pickling itself. (L2, EG-a)

M

METALLOGRAPHY, CONSTITUTION AND PRIMARY STRUCTURES

58-M. Constitution of the System Gallium-Indium. John P. Denny, J. Hugh Hamilton, and John R. Lewis. *Journal of Metals,* v. 4, Jan. 1952; *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 194, 1952, p. 39-42.

Constitution was determined by thermal methods. An experimentally determined metastable equilibrium line (an extension of the In-rich liquidus) was obtained. The various alloys were studied metallographically using polished samples obtained by a casting method. Photomicrographs. (M24, Ga, In)

59-M. Constitution and Properties of Some Iron-Bearing Cupro-Nickels. E. W. Palmer and F. H. Wilson. *Journal of Metals,* v. 4, Jan. 1952; *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 194, 1952, p. 55-64.

Constitution of alloys in the Cu-rich corner of the system, and variations in hardness and tensile properties resulting from heat treatment of alloys containing various amounts of Fe. Most of this work is concerned with alloys containing 10% Ni. With over 0.75% Fe, the 10% Ni alloy is susceptible to precipitation hardening. Consequences of this fact in connection with commercial production. Results are graphed and tabulated. (M24, Q27, Q29, Cu)

60-M. Crystal Structure of TiAl. Pol Duwez and Jack L. Taylor. *Journal of Metals,* v. 4, Jan. 1952, *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 194, 1952, p. 70-71.

The present knowledge of the Ti-Al system is limited to the portion of the diagram extending from pure Al to the intermetallic compound $TiAl_3$. From an X-ray diffraction study of alloys containing up to 75% Al ($TiAl_3$), the phase boundaries at 750° C. were located. Crystal structure of a new phase is described. (M24, M26, Ti, Al)

61-M. Crystal Structure of $TaCr_2$ and $CbCr_2$. Pol Duwez and Howard Martens. *Journal of Metals,* v. 4, Jan. 1952; *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 194, 1952, p. 72-74.

The only intermediate phases in both the Ta-Cr and the Cb-Cr systems correspond to the ideal stoichiometric ratio $TaCr_2$ or $CbCr_2$. Both structures are cubic, $MgCu_2$ type. At high temperature, however, $TaCr_2$ has a hexagonal $MgZn_2$-type structure, which can be retained at room temperature by fast cooling. Tabulated diffraction data. (M26, Ta, Cr, Cb)

62-M. A Sensitive Method for Thermal Analysis of Very Low Melting Alloys. R. M. Evans, E. O. Fromm, and R. I. Jaffee. *Journal of Metals,* v. 4, Jan. 1952; *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 194, 1952, p. 74-75.

Apparatus and method developed for work in the range −72 to 250° C., but adaptable to broader temperature ranges. Typical data for a Ga-rich Ga-Sn-Zn alloy are charted. (M23, Ga)

63-M. Method for Locating Two-Liquid Immiscibility Limits. R. E. Bish. *Journal of Metals,* v. 4, Jan. 1952; *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 194, 1952, p. 81-82.

Method consists essentially in the measurement of the local electrical resistivity at a sequence of levels in the molten bath. Where a change of phase is encountered, the resistivity changes sharply. This measurement was made by use of a tungsten-wire probe for the Cu-Pb system. (M24, Cu, Pb)

64-M. The Crystal Structures of Some Thorium and Uranium Compounds. Norman Charles Baenziger. *U. S. Atomic Energy Commission,* AECD-3237, Oct. 15, 1948, 114 pages.

Isostructural compounds with the composition U_6M and Th_7M_3 (where M = Fe, Co, or Ni) were found and their structures determined. Single crystals, examined by the rotation, oscillation, Laue and Weissenberg methods, exhibited diffraction symmetry. A new method for determination of X-ray intensities. Data are tabulated. 61 ref. (M26, U, Th)

65-M. Compounds of Thorium With Transition Metals. I. The Thorium-Manganese System. John V. Florio, R. E. Rundle, and A. I. Snow. *U. S. Atomic Energy Commission,* AECD-3249, Aug. 24, 1951, 32 pages.

Like U, Th forms no compounds with Cr, a few with Mn, the number increasing through Ni, and decreasing sharply with Cu. Structures of the compounds of Th with Mn. Data are tabulated. Diagrams. (M24, Th, Mn)

66-M. Sigma Phase in Vanadium-Nickel Alloys. W. B. Pearson and J. W. Christian. *Nature,* v. 169, Jan. 12, 1952, p. 70-71.

An X-ray examination was made of a V-Ni sigmaphase single crystal containing 60 at. % V. Results are in agreement with those of previous workers for the Fe-Cr and the Co-Cr sigma phase. V-Ni alloys have the advantage, however, that when Cr radiation is used, there is an appreciable difference in the X-ray scattering power of the V and Ni atoms. (M26, V, Ni)

67-M. Concerning the First Images Obtained With a Proton Microscope. (In French.) Paul Chanson and Claude Magnan. *Comptes Rendus hebdomadaires des Séances de l'Académie des Sciences,* v., 233, Dec. 3, 1951, p. 1436-1438.

The proton microscope and some of the first results obtained by its use. 11 ref. (M23)

68-M. Methods and Application of Electron Diffraction in Industrial Research. (In German.) Adrian Stahl. *Zeitschrift für angewandte Physik,* v. 3, Sept. 1951, p. 349-360; Oct. 1951, p. 382-396.

Reviews the literature. The theoretical basis, apparatus used, and the testing of materials. 552 ref. (M22, S general)

69-M. The Luminous Screen as Aid in X-Ray Investigation of Fine Structures. (In German.) Johann Christian Lankes, Erika Orlamünder, and Gunter Wassermann. *Zeitschrift für Metallkunde,* v. 42, Oct. 1951, p. 300-301.

Use of the above for direct observation of metal-crystal interferences in rotating and Laue pictures. (M22)

70-M. Crystal Structure of $NiMg_2$, $CuMg_2$, and $AuMg_3$. (In German.) Konrad Schubert and Kurt Anderko. *Zeitschrift für Metallkunde,* v. 42, Nov. 1951, p. 321-325.

Crystal structure was investigated. Data are tabulated. Unit-cell arrangements are shown diagrammatically. 16 ref. (M26, Ni, Mg, Cu, Au)

71-M. The Ternary System Copper-Nickel-Magnesium. (In German.) Werner Köster. *Zeitschrift für Metallkunde,* v. 42, Nov. 1951, p. 326-327.

Determination of the system by thermal analysis and structural observations. (M24, Cu, Ni, Mg)

72-M. The Structure of Manganese-Copper-Nickel Alloys With High Manganese Content. (In German.) Ulrich Zwicker. *Zeitschrift für Metallkunde,* v. 42, Nov. 1951, p. 331-335.

Various methods for investigating the above ternary system with low Cu content. Structures and phase limits of the system. Measurements of ductility and hardness. 10 ref. (M24, Q23, Q29, Mn)

73-M. Electron Microscope and Diffraction Studies of Metallic Smoke. (In Japanese.) Riitsu Takagi. *Journal of Mechanical Laboratory,* v. 5, July 1951, p. 107-110.

Many fringes called "extinction contours" in the electron-microscope images of Al thin sections prepared by an electrolytic method were observed and explained by variation of thickness and distortion of the crystals. Many similar characteristic fringes were observed in electron-microscope images of thin-plate crystals of MoO_3. (M21, M22, Al, Mo)

74-M. Relations Between Structure and Mechanical Properties of the Bicycle Chain's Outer Links. (In Japanese.) Kunio Futaki. *Journal of Mechanical Laboratory,* v. 5, Aug. 1951, p. 135-139.

An attempt was made to determine the relation between ASTM grain size by McQuaid-Ehn test and mechanical properties such as strength and hardness of bicycle chain's outer links after final heat treatment; also the relation between structure after the final quench and temper, and load-elongation curve of the chains. It was found that the gradient of the load-elongation curve is influenced by growth of granular cementite. A direct relation between ASTM grain size by the McQuaid-Ehn test and microstructures of the outer links after heat treatment was not found, but the relation of the ASTM grain size to ferrite and pearlite grain size resulting from normalizing was determined. (M27, ST)

75-M. Preparation of Mo_3Ge and Determination of Its Structure. Alan W. Searcy, Robert J. Peavler, and H. J. Yearian. *Journal of the American Chemical Society,* v. 74, Jan. 20, 1952, p. 566-567.

The alloy was prepared by heating mixtures of Mo and Ge powders for several hours at 1000° C. Crystal structure and cell dimen-

sions were determined by X-ray diffraction. (M26, Mo, Ge)

76-M. A Technique for Preparing Beta-Ray Autoradiographs of Metals and Minerals. A. B. Michael, W. Z. Leavitt, M. B. Bever, and H. R. Spedden. *Journal of Applied Physics,* v. 22, Dec. 1951, p. 1403-1406.

Limitations of this technique for microstructural investigations and possible variations. Illustrative examples of autoradiographs are interpreted. 18 ref. (M23)

77-M. Atomic Size Effect in the X-Ray Scattering by Alloys. B. E. Warren, and B. L. Averback and B. W. Roberts. *Journal of Applied Physics,* v. 22, Dec. 1951, p. 1493-1496.

If there are appreciable differences in both size and scattering power of two atoms, the size effect can produce modulations in the diffuse intensity which are comparable in size to those produced by short-range order. (M25)

78-M. Electron Diffraction Study on the Ordered Alloy Au_3Cu. S. Ogawa and D. Watanabe. *Journal of Applied Physics,* v. 22, Dec. 1951, p. 1502.

Results are compared with those of previous investigators. (M26, M22, Au)

79-M. The Solid Solutions of Zinc in Aluminium. E. C. Ellwood. *Journal of the Institute of Metals,* v. 80, Jan. 1952, p. 217-224.

The lattice spacings of the solid solutions of Zn in Al were determined at room and elevated temperatures up to the solidus. The phase boundaries of the solid solutions, including the solidus, were determined from the X-ray results and agree well with the published diagram. At room temperature the lattice spacings show that the apparent atomic diameter of Al increases in two separate steps as Zn is added, and it is suggested that these increases are associated with the filling of Brillouin zones. 21 ref. (M24, M26, Zn, Al)

80-M. Vanadium-Oxygen Solid Solutions. A. U. Seybolt and H. T. Sumsion. *Journal of Metals,* v. 4, Feb. 1952, p. 145.

Reports on an investigation of the V-rich portion of the $V\text{-}O_2$ phase diagram undertaken as part of a study of the effects of gaseous impurities on the properties of pure V. Results indicate occurrence of an order-disorder transition similar to that for Cu-Au and Co-Pt alloys. (M24, N10, V)

81-M. Orientation Relationships in Cast Germanium. W. C. Ellis and Jacqueline Fageant. *Journal of Metals,* v. 4, Feb. 1952, p. 149.

Examined microscopically and by X-ray diffraction. Micrographs. (M27, M26, Ge)

82-M. One and Two Dimensional Sections of Three Dimensional Structures. C. S. Smith and L. Guttman. *Journal of Metals,* v. 4, Feb. 1952, p. 150.

By a simple linear intercept counting method involving no assumptions as to actual shape or distribution of grain boundaries, it is possible to determine accurately the amount of grain-boundary surface in any specimen. (M27)

83-M. General Aspects of Metallic Binary Phase Diagrams. R. A. Oriani. *Journal of Metals,* v. 4, Feb. 1952, p. 151.

Correlation of general features with atomic properties. (M24)

84-M. The Influence of Solute Atoms on Crystallographic Texture and Creep Properties. C. L. Corey. *Journal of Metals,* v. 4, Feb. 1952, p. 152.

X-Ray integrated intensity measurements were made to determine mosaic block sizes of a base alloy of nominally 20% Cr, 20% Ni, 20% Co, 40% Fe and various modifications made by adding individually Mo, W, or Cb. Creep tests were conducted at 1200 and 1500° F. (M26, Q3, AY)

85-M. Twinning in Silicon. E. I. Salkovitz and F. W. von Batchelder. *Journal of Metals,* v. 4, Feb. 1952; *Transactions of American Institute of Mining and Metallurgical Engineers,* v. 194, p. 165.

Results of an investigation on twinning produced during slow cooling. Micrographs. (M27, Si)

86-M. Diffraction Patterns and Crystal Structure of Si_3N_4 and Ge_3N_4. W. C. Leslie, K. G. Carroll, and R. M. Fisher. *Journal of Metals,* v. 4, Feb. 1952; *Transactions of American Institute of Mining and Metallurgical Engineers,* v. 194, 1952, p. 204-206.

A nitride, believed to be Si_3N_4 was separated from three nitrided silicon steels. Ge_3N_4 was prepared from pure Ge. Comparison of the diffraction patterns indicates that the two nitrides are isomorphous; an orthorhombic structure is suggested in place of the rhombohedral structure previously reported for Ge_3N_4. Micrographs. (M26, Si, Ge)

87-M. Effect of Temperature on the Lattice Parameters of Magnesium Alloys. R. S. Busk. *Journal of Metals,* v. 4, Feb. 1952; *Transactions of American Institute of Mining and Metallurgical Engineers,* v. 194, 1952, p. 207-209.

A series of eight alloys, consisting of pure Mg, Mg + Ag, Mg + Al and Mg+ Sn were studied. Data are graphed and tabulated. (M26, Mg)

88-M. Observations on the Occurrence of Ti_2X Phases. W. Rostoker. *Journal of Metals,* v. 4, Feb. 1952; *Transactions of American Institute of Mining and Metallurgical Engineers,* v. 194, 1952, p. 209-210.

The following alloys were prepared: Ti_2Cu, Ti_4Cu_2O, Ti_2Ni, Ti_4Ni_2O, Ti_2Co, Ti_4Co_2O, Ti_2Mn, and Ti_4Mn_2O. A summary of structures and lattice parameters of the phases found is given. (M26, Ti)

89-M. Crystal Structure of Ti_3Sn. Paul Pietrokowsky. *Journal of Metals,* v. 4, Feb. 1952; *Transactions of American Institute of Mining and Metallurgical Engineers,* v. 194, 1952, p. 211-212.

Results of an investigation. Data are tabulated. 11 ref. (M26, Ti, Sn)

90-M. Observations on the Lattice Parameters of the Alpha Solid Solution in the Titanium-Aluminum System. W. Rostoker. *Journal of Metals,* v. 4, Feb. 1952; *Transactions of American Institute of Mining and Metallurgical Engineers,* v. 194, 1952, p. 212-213.

Results on the above investigation are presented graphically. (M26, Ti, Al)

91-M. Cathodic Etcher. *Metal Industry,* v. 80, Jan. 18, 1952, p. 53.

New metallographic technique for studying grain structure. The sample is subjected to glow discharge under vacuum. (M23)

92-M. Grain Size of Rolled and Annealed Aluminum Alloys; Effect of Rate of Heating. J. Herenguel and F. Santini. *Metal Treatment and Drop Forging,* v. 19, Jan. 1952, p. 15-19, 26.

Influence of the rate of heating, exemplified by salt bath and air furnace treatment of 99.5% Al and Al alloys of the D. T. D. 346 or HS-10 type. Resulting mechanical properties. Micrographs. (M27, Q general, Al)

93-M. Diffraction of X-rays at Small Angles by Cold Worked Metals. (In French.) Jean Blin and André Guinier. *Comptes Rendus hebdomadaires des Séances de l'Académie des Sciences,* v. 233, Nov. 19, 1951, p. 1288-1290.

In a metal submitted to strong cold working, submicroscopic cavities are present, the number of which can be estimated from the X-ray diffraction pattern. Most of the experiments were conducted on high-purity Cu, cast under vacuum, and reduced by cold rolling to 10-90% of the original dimensions. (M22, Q24, Cu)

94-M. Demountable X-Ray Tube for Radiocrystallographic Studies. (In French.) Ch. Legrand. *Journal des Recherches du Centre National de la Recherche Scientifique,* no. 16, 1951, p. 31-34.

A new tube which makes possible easy and exact adjustments as well as fine focusing. Diagrams and photograph. (M21)

95-M. X-Ray Examination of Two Gold Plates From Archaelogical Excavations. (In French.) A. R. Weill. *Metallurgia Italiana,* v. 43, Dec. 1951, p. 507-511.

Nondestructive investigation of plates found at Kertsch and preserved in the Louvre. Measurement of density was followed by X-ray diffraction study of crystal structure. Composition and method of fabrication were deduced from the results. (M22, M26, P10, Au)

96-M. Contribution of X-Rays to Study of the Mechanism of Plasticity of Metals. (In French.) A. Guinier. *Métaux: Corrosion Industries,* v. 26, Nov. 1951, p. 427-432.

Use of X-rays for quantitative study of plastic deformations, orientation of crystallites in deformed metal, polycrystalline metals, and locating structural defects. Diagrams and photomicrographs. 18 ref. (M22, Q24, S13)

97-M. Ion Exchangers as Aids in the Laboratory. (In German.) G. Dickel and K. Titzmann. *Angewandte Chemie,* v. 63, Oct. 7, 1951, p. 450-457.

Possible uses (especially of synthetic-resin exchangers), discussing specifically the chemical and physical structure of exchangers, principles of action, equilibriums, and rate of exchange, also a mathematical method of determining separation in exchanger columns. Numerous practical examples supplement the discussion. Data are charted. 68 ref. (M23)

98-M. The Palladium-Cadmium System. (In German.) H. Nowotny, A. Stempfl, and H. Bittner. *Monatshefte für Chemie und verwandte Teile anderer Wissenschaften,* v. 82, Dec. 15, 1951, p. 949-958.

Study of phase equilibria with the aid of microscopic, X-ray, and magnetic methods. Tables, graphs, photomicrographs, and references. (M24, Pd, Cd)

99-M. The Palladium-Zinc System. (In German.) H. Nowotny, E. Bauer, and A. Stempfl. *Monatshefte für Chemie und verwandte Teile anderer Wissenschaften,* v. 82, Dec. 15, 1951, p. 1086-1093.

X-ray, microscopic, thermo-analytical, and magnetic study. Graphs, tables, photomicrographs, and references. (M24, Pd, Zn)

100-M. Note on Magnesium Telluride. (In German.) W. Klemm and K. Wahl. *Zeitschrift für anorganische und allgemeine Chemie,* v. 266, Nov. 1951, p. 289-292.

Preparation and structure. Tabular data and apparatus diagram. 10 ref. (M26, Mg, Te)

101-M. Crystal Structure of GeTe. (In German.) Konrad Schubert and Horst Fricke. *Zeitschrift für Naturforschung,* v. 6a, Dec. 1951, p. 781-782.

The lattice constants of the GeTe intermediate phase in Ge-Te alloys. 11 ref. (M26, Ge, Te)

102-M. Metallography of "Xanthal B Type" (Cu-Al-Fe-Ni) Bronze. (In Italian.) A. Gragnani. *Alluminio,* v. 20, Nov. 1951, p. 423-439.

Comprehensive study of structure, transformations, and quenching and tempering relationships for alloy containing 81% Cu, 11% Al, 4% Fe, 4% Ni. Recommended tempering conditions. Graphs, phase diagrams, and photomicrographs. 18 ref. (M27, M24, J26, Cu)

103-M. Contribution to the Study of the Morphology of Nonmetallic Inclusions in Iron and Steel Products—Inclusions in Ferrotungsten. (In Italian.) R. Zoja and M. T. Gottardi. *Metallurgia Italiana,* v. 43, Dec. 1951, p. 526-529.

89 specimens taken from 29 different stocks were examined and a list of the most characteristic inclusions is given for ferrotungsten. Inclusions differ from those in ferrochromium. Photomicrographs and tables. (M28, Fe-n)

104-M. The Question of the Structure of the Emission Component of Kubetskii Tubes. (In Russian.) S. M. Fainshtein and L. I. Tatarinova. *Doklady Akademii Nauk SSSR,* new ser., v. 79, July 21, 1951, p. 435-438.

The crystallographic structure and the mechanisms of forming the surface layers of electron emitters were studied for the system Cu-S-Cs. Data are tabulated. (M26)

105-M. The Relationship Between Lattices of the NiAs and Ni_2In Type and Certain Rhombic Crystals. (In Russian.) I. I. Kripiakevich. *Doklady Akademii Nauk SSSR,* new ser., v. 79, July 21, 1951, p. 439-442.

The lattice constants of the above systems were compared. Results are tabulated. 14 ref. (M26, Ni, As, In)

106-M. Saturation of the Surface Layers of Steel With Cerium. (In Russian.) N. T. Gudtsov and G. N. Dubinin. *Izvestiia Akademii Nauk SSSR,* Section of Technical Sciences, Apr. 1951, p. 565-575.

The surfaces of steels containing 0.03-1.18% C were treated with Ce at 1000 and 1100° C. for different periods of time. Microscopic and X-ray studies were made of the surface layers. Purpose was to determine the Fe-Ce equilibrium diagram. Results are tabulated and charted. (M24, ST, Fe, Ce)

107-M. Diffraction Methods in the Metallurgical Industry. (In Spanish.) F. R. Morral. *Nucleo,* v. 6, Oct. 1951, p. 10-14.

Methods and apparatus. Results are tabulated and discussed. (M22)

108-M. A Technique for Making Strain-Free Replicas for Electron Metallography. William L. Grube and Stanley R. Rouze. *ASTM Bulletin,* Jan. 1952, p. 71-73.

An investigation to develop a satisfactory procedure which does not subject Formvar to undue stress and which will result in a strain-free replica. (M21)

109-M. Nodules and Nuclei in Nodular Iron. J. E. Rehder. *American Foundryman,* v. 21, Feb. 1952, p. 44-48.

Work on the metallography and constitution of nodular-iron graphite at the Canadian Department of Mines & Technical Surveys. Numerous photomicrographs of nodules and nuclei illustrate details seen through optical and electron microscopes. (M27, CI)

110-M. Graphical Indexing of Powder Patterns of Cubic Substances and the Choice of Radiation For Precision Measurements of Lattice Parameters. M. E. Straumanis. *American Mineralogist,* v. 37, Jan.-Feb. 1952, p. 48-52.

A convenient graphical method showing how to find the most suitable X-radiation for precision determination of lattice parameters, and at the same time, index the powder patterns. It is based on application of the three-dimensional reciprocal lattice and is very simple, especially in the case of cubic crystals. (M26)

N

TRANSFORMATIONS AND RESULTING STRUCTURES

39-N. Secondary Recrystallization Texture in Copper. M. Sharp and C. G. Dunn. *Journal of Metal,* v. 4, Jan. 1952; *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 194, 1952, p. 42-43.

Orientations of 137 crystals of Cu were produced by secondary recrystallization in a cube texture matrix. Although the crystals were not prepared for the purpose of determining a secondary recrystallization texture, the orientations obtained confirm, in part, published results and disclose preferred orientations in the texture. (N5, Q24, Cu)

40-N. Solidification Mechanism of Steel Ingots. H. F. Bishop, F. A. Brandt, and W. S. Pellini. *Journal of Metals,* v. 4, Jan. 1952; *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 194, 1952, p. 44-54.

The solidification mechanism of low and high-carbon experimental steel ingots was studied by thermal analysis. It was determined that solidification proceeds in wave-like fashion at rates which are determined by the carbon level, superheat, and mold thickness. The thermal cycles of the mold walls are related to the course of solidification. Phase diagrams. 10 ref. (N12, D9, CN)

41-N. Annealing Textures in Rolled Face-Centered Cubic Metals. Paul A. Beck and Hsun Hu. *Journal of Metals,* v. 4, Jan. 1952; *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 194, 1952, p. 83-90.

Investigation of the orientation relationship between deformation texture and recrystallization texture in rolled face-centered cubic metals, using the quantitative methods of texture determination that have recently become available. Al, Cu, and brass were investigated. Quantitative pole figures for annealing textures. 40 ref. (Q24, N5, Al, Cu)

42-N. On the Solution of Diffusion Problems Involving Concentration-Dependent Diffusion Coefficients. Carl Wagner. *Journal of Metals,* v. 4, Jan. 1952; *Transactions of the American Mining and Metallurgical Engineers,* v. 194, 1952, p. 91-96.

Solutions of the differential equation of diffusion in binary alloys if the diffusion coefficient is an exponential function of the concentration of one of the components. (N1)

43-N. Nucleation in Phase Changes. R. S. Bradley. *Quarterly Reviews,* v. 5, no. 4, 1951, p. 315-343.

A comprehensive theoretical review. Numerous references. (N2)

44-N. Experimental Demonstration of Two Types of Solidification Occurring During Plastic Deformation of Crystals. (In German.) Fritz Röhm and Werner Sautter. *Zeitschrift für Metallkunde,* v. 42, Oct. 1951, p. 289-293.

As applied to Al single crystals. Dependence of the recovery upon various factors. Charts, and diagrams. 10 ref. (N4, Q24, Al)

45-N. A New Point of View on the Theory of Metal Solidification. (In German.) Jakob Bingel. *Zeitschrift für Metallkunde,* v. 42, Oct. 1951, p. 309-315.

A new theory, according to which solidification curves are deduced analytically on the basis of the mechanical notch effect within the crystal. The theory is based upon the phenomenon of crystal division, causing an increase in the internal energy of the crystal. The hardening of metals is discussed on the same basis. 21 ref. (N12)

46-N. The Gamma Phase of Manganese. II. High-Temperature X-Ray Diagrams in the Gamma-Phase Region. (In German.) Ulrich Zwicker. *Zeitschrift für Metallkunde,* v. 42, Nov. 1951, p. 327-330.

Method for investigation of transformations. Data are tabulated and charted. (N6, M22, Mn)

47-N. The Lamellar Growth of Crystals. I. Experimental Part. (In German.) Ludwig Graf. *Zeitschrift für Metallkunde,* v. 42, Nov. 1951, p. 336-340.

Method for obtaining rapidly cooled samples showing intermediate, lamellar crystalline growth. Results show that both lamellar and dendritic structures are basic phenomena in crystal growth, differing according to crystal type. Micrographs show results obtained with Cu, Zn, W, Cd, Pb, Au, and NaCl. (N12, Cu, Zn, W, Cd, Pb, Au)

48-N. Investigation of Aluminum-Silicon Alloys; A Contribution to the Silumin Problem. (In German.) Roland Mitsche and Emma-Maria Onitsch-Modl. *Zeitschrift für Metallkunde,* v. 42, Nov. 1951, p. 341-344.

Reviews the refining of Silumin on the basis of the literature, adding results of new investigations. The definite similarity between the structural development of eutectic Al-Si and Fe-C alloys makes the assumption of a similar mechanism possible. Implications are discussed. 14 ref. (N12, Al)

49-N. An Experimental Investigation of the Diffusion of Electrolytic Hydrogen Through Metals. H. R. Heath. *British Journal of Applied Physics,* v. 3, Jan. 1952, p. 13-18.

An investigation was made on Fe, Ni, Co, Cu, Zn, Ag, Pd, Pt and Pb. Theory explaining general character of results given. 12 ref. (N1)

50-N. Examination and Rehabilitation of Graphitized Welded Joints. I. A. Rohrig and R. M. Van Duzer. *Combustion,* v. 23, Jan. 1952, p. 36-42.

Practice of Detroit Edison Co. in systematically checking high-temperature alloy-steel piping welds for signs of graphitization, also weld-deposition procedures employed to restore the welds. Micrographs, macrographs, and illustrations. 15 ref. (N8, K9, L24, AY)

51-N. Solidification of Metals. H. F. Bishop, and W. S. Pellini. *Foundry,* v. 80, Feb. 1952, p. 86-93, 253-261.

Summarizes recent information regarding the mode of solidification of important commercial metals. Basic factors which determine specific mode of solidification and practical applications to problem of producing sound castings. (N12)

52-N. A Method of Growing Single Crystals of Lead Telluride and Lead Selenide. W. D. Lawson. *Journal of Applied Physics,* v. 22, Dec. 1951, p. 1444-1447.

Crystals were grown for the purpose of testing the semiconducting and allied properties of PbTe and PbSe. (N12, P15, Pb, Te, Se)

53-N. The Transmission of Hydrogen Through Metals. H. B. Wahlin. *Journal of Applied Physics,* v. 22, Dec. 1951, p. 1503.

Experiments on Pd, Ni, Cb, Ta, and Mo. Substitution of electrolytic method for the heated Pd tube as a source of high-pressure, pure hydrogen in the laboratory. (N1)

54-N. Studies on the Kinetics of Transformation in Titanium Base Alloys. W. Rostoker. *Journal of Metals,* v. 4, Feb. 1952, p. 145.

A brief report. (N9, M24, Ti)

55-N. Diffusion in Iron Oxides. L. Himmel, R. F. Mehl, and C. E. Birchenall. *Journal of Metals,* v. 4, Feb. 1952, p. 147.

Measurements were made of the

rates of self-diffusion of Fe in each of the three oxides of iron, using the decrease-in-surface-activity method with Fe as tracer. (N1, Fe)

56-N. Solid Solubility of Boron in Iron. M. E. Nicholson. *Journal of Metals*, v. 4, Feb. 1952, p. 148.

The solubility of B in α and γ Fe was redetermined. (N12, Fe, B)

57-N. The System Molybdenum-Boron. R. Steinitz. *Journal of Metals*, v. 4, Feb. 1952, p. 148.

The above was investigated in order to clarify its behavior at high temperatures. (N6, M24, Mo, B)

58-N. Distribution of Solute Elements Between Liquid and Solid Germanium. J. D. Struthers, H. C. Theuerer, E. Buehler, and J. A. Burton. *Journal of Metals*, v. 4, Feb. 1952, p. 149.

Concentrations range from 0.01 to 100 p.p.m. A known amount of Al, Ga, In, P, As, Sb, Ag or Au was added to a Ge melt from which either a single crystal or a polycrystalline ingot is prepared. The concentration of the element in the resulting solid Ge was determined as a function of the fraction solidified using radioactive-tracer techniques and electrical-conductivity measurements. (N12, Ge)

59-N. Generation of Porosity During Diffusion. R. W. Balluffi and B. H. Alexander. *Journal of Metals*, v. 4, Feb. 1952, p. 152.

A metallographic investigation of copper-α-brass, Ni-Cu, and Au-Ag couples revealed that significant porosity was caused directly by diffusion and was not a result of other possible causes. (N1, Cu)

60-N. Growth of Austenite in Cold-Rolled Tempered Martensite. A. E. Nehrenberg. *Journal of Metals*, v. 4, Feb. 1952; *Transactions of American Institute of Mining and Metallurgical Engineers*, v. 194, 1952, p. 181.

In cold rolled tempered martensite, austenite grows in an equiaxial, rather than an acicular manner. Results of an experiment carried out to aid in understanding of this behavior. Micrographs. (N8, ST)

61-N. Kinetics and Orientation Relationships of Secondary Recrystallization in Silver. F. D. Rosi, B. H. Alexander, and C. A. Dube. *Journal of Metals*, v. 4, Feb. 1952; *Transactions of American Institute of Mining and Metallurgical Engineers*, v. 194, 1952, p. 189-196.

The above phenomenon was investigated in the range 433-533° C. Results show that secondary grains have a preferred orientation which corresponds closely to that of the original deformation texture. Micrographs and graphs. 17 ref. (N5, Ag)

62-N. Work Required in the Formation of Martensite Nuclei. *Metal Progress*, v. 61, Jan. 1952, p. 122, 124, 126, 128, 146. (Translated and condensed from paper by G. V. Kurdyumov and O. P. Maksimova.)

Previously abstracted from *Doklady Akademii Nauk SSSR*. See item 201-N, 1950. (N8, ST)

63-N. The Position of the Ar^{III} Point in Chromium-Nickel Stainless Steel and Its Displacement by Cold Working. (In French.) Paul Bastien and Jacques Dedieu. *Métaux: Corrosion—Industries*, v. 26, Nov. 1951, p. 423-426.

Methods and results of investigation. The influence of Ni on the lowering of the Ar^{III} point in particular. Includes diagrams and charts. (N8, SS)

64-N. Causes of the Formation of Different Types of Primary Structures During the Crystallization of Steels. (In Russian.) A. P. Pronov. *Izvestiia Akademii Nauk SSSR*, Section of Technical Sciences, Apr. 1951, p. 576-578.

The effects of casting temperature and nonmetallic inclusion on the crystallization of steel ingots. Photomicrographs. (N12, ST)

65-N. Mechanism of Graphitization During Production of Nodular Cast Iron. (In Spanish.) Jose M. Navarro Alvargonzalez. *Instituto del Hierro y del Acero*, v. 4, Apr.-June 1951, p. 143-146.

A series of photomicrographs of sections of some nodules suggesting the probable mode of their formation. (N8, E25, CI)

66-N. Note on the Formation of Nodular Graphite in Castings Treated With Magnesium. (In Spanish.) Francisco Munoz del Corral. *Instituto del Hierro y del Acero*, v. 4, July-Sept. 1951, p. 227-229.

Briefly discusses theory. Includes diagrams. (N8, E25, CI)

67-N. Industrial Applications of the Isothermal Transformations of Austenite. (In Spanish.) Manuel Torrado. *Técnica Metalurgica*, v. 7, Mar. 1951, p. 58-66.

Isothermal, chronographic, and isochronal curves and their application in production of sintered bodies, airplane motors, high speed steels, etc. Charts, photomicrographs, and diagrams. 22 ref. (N8, ST)

68-N. Isothermal Transformation Of Austenite. (In Swedish.) **I. Introduction.** Axel Hultgren. **II. Transformation Diagram and Structures.** Axel Hultgren and others. **III. Distribution of Alloy Steels.** Kehsin Kuo and Axel Hultgren. **IV. Discussion of Results Obtained.** Axel Hultgren. **Appendix I. Preparation for Microscopic Investigation.** Axel Hutlgren and Kai Tikkanen. **Appendix II. Isolation and Chemical Analysis of Carbides in Steels.** Kehsin Kuo. *Jernkontorets Annaler*, v. 135, No. 8, 1951, p. 403-483; disc., p. 483-494.

Several ternary alloy steels of low alloy contents, and with usual amounts of Si, Mn, P and S, were examined. In most of them, cementite was the only carbide constituent present. Isothermal transformation rates and structures were studied and TTT-diagrams obtained. The carbide constituent was isolated electrolytically, X-rayed and analyzed: after tempering of martensite at constant temperatures for different periods at that temperature; and in bainite, as freshly formed near the nose temperature and after subsequent holding at different temperatures. Many graphs, diagrams, and photomicrographs. 18 ref. (N8, ST)

69-N. The Diffusion of Copper in Cuprous Oxide. Walter J. Moore and Bernard Selikson. *Journal of Chemical Physics*, v. 19, Dec. 1951, p. 1539-1543.

Cu_2O strips were prepared by the oxidation of Cu at 1000° C. The diffusion of radiocopper in this material at 800 to 1050° gave a self-diffusion coefficient. It is suggested that parabolic rate constants with large negative entropies of activation and low heats of activation may be due to grain boundary diffusion. Data graphed, tabulated. (N1, Cu)

70-N. The Aging of Metals. J. Lomas. *Machinery Lloyd*, (Overseas Edition), v. 24, Jan. 9, 1952, p. 108-109, 111, 113.

Summarizes briefly the existing state of knowledge. The difference between the terms "quench-aging" and "strain-aging," and the methods of obtaining the optimum results with given materials. (N7, J27)

P

PHYSICAL PROPERTIES AND TEST METHODS

73-P. Experimental Research on the "Wetting Effect" and "Liquostriction". C. Benedicks and R. Harden. (Translated and condensed.) *Engineers' Digest*, v. 12, Dec. 1951, p. 408-412.

Previously abstracted from *Metallurgia Italiana*. See item 376-P, 1951. (P10, Q23)

74-P. Heats of Formation of Sodium-Tin Alloys Determined With a New High Temperature Calorimeter. Raleigh L. McKisson and LeRoy A. Bromley. *Journal of Metals*, v. 4, Jan. 1952; *Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 194, 1952, p. 33-38.

A high-temperature calorimeter was designed for use up to 1500° K. Theory of its operation. This calorimeter was used to measure the heats of formation of Na-Sn alloys ranging in composition from Sn to Na_3Sn. The values tend to support those reported by Kubaschewski and Seith. Graphs and tabulated data. 15 ref. (P12, Sn, Na)

75-P. Volatility and Stability of Metallic Sulphides. C. M. Hsiao and A. W. Schlechten. *Journal of Metals*, v. 4, Jan. 1952; *Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 194, 1952; p. 65-69.

The apparent vapor pressures of a number of metal sulfides were determined by measuring their rate of weight loss when they were heated under vacuum. Information should be useful in determining the practicality of selective volatilization of the sulfides as well as an aid in planning direct reduction processes for sulfide ores. Graphed and tabulated data. 18 ref. (P12, C21)

76-P. Engineering Aspects of Liquid Metals for Heat Transfer. Thomas Trocki. *Nucleonics*, v. 10, Jan. 1952, p. 28-32.

Work accomplished with developmental systems indicates that liquid metals hold considerable promise as reactor coolants and heat-transfer fluids for systems operating above 600° F. Comparative physical properties of Na, NaK, "Heat-transfer salt", Dowtherm A, Hg, Pb, Pb-Bi eutectic, Li, and H_2O are tabulated. Handling and safety problems, system design and construction, liquid-metal heat exchangers, advantages of liquid metals in pumping and instrumentation, and purification of liquid metals. (P11, T25)

77-P. Properties of Solids. Melvin A. Cook. *Utah Engineering Experiment Station* (Salt Lake City), Bulletin 53, Sept. 1951, 68 pages.

Empirical correlation of band properties of solids, thermal expansion and chemical bonding in homonuclear solids, compressibility of homonuclear solids, conductivity of metals, and an interpretation of nonclassical energy relations in chemical bonds. (P general)

78-P. Optical Properties of Tellurium in the Infra-Red. T. S. Moss. *Proceedings of the Physical Society*, v. 65, sec. B, Jan. 1, 1952, p. 62-66.

The refractive index and absorption constant of Te layers were measured in the near infrared. The refractive index was measured over the wavelength range 3-11 μ. The value extrapolated to long wavelengths was found to be 4:8; this is much higher than any other known refractive index. (P17, Te)

79-P. The Work Functions of Copper, Silver, and Aluminium. E. W. J. Mitchell and J. W. Mitchell. *Proceedings of the Royal Society*, Ser. A, v. 210, Dec. 7, 1951, p. 70-84.

Changes in the work functions of metallic surfaces which result from adsorption of O_2 and formation of oxide films on the surfaces. Cu, Ag, and Al were used for these experiments, because they show three distinct types of behavior when they react with O_2. 22 ref. (P15, R2, Ag, Cu, Al)

80-P. The Reduction Equilibria of Zinc Oxide and Zinc Silicate With Hydrogen. J. A. Kitchener and S. Ignatowicz. *Transactions of the Faraday Society,* v. 47, Dec. 1951, p. 1278-1286.

An improved method for studying equilibria between solids and gases at high temperature was developed. Measurements were made in the range 750-1000° C. The results lead to values of free energy, heat, and entropy of formation of ZnO and Zn_2SiO_4 which are in good agreement with values calculated from other thermochemical data. 11 ref. (P12, Zn)

81-P. The Adsorption on Metal Surfaces of Long Chain Polar Compounds From Hydrocarbon Solutions. S. G. Daniel. *Transactions of the Faraday Society,* v. 47, Dec. 1951, p. 1345-1359.

In studies on Cu, Pb, Zn, and Cd, the isotherms could not be determined because of reactions between the acid and oxide films on the metal surface. In general, ease of adsorption increases with increasing chain length and, for a given chain length, the acid is most strongly adsorbed and the ester least, with the alcohol intermediate. Influence upon adsorption of other factors such as temperature and solubility. In some cases it was possible to calculate free energy and heat of adsorption. Data are graphed. 17 ref. (P13)

82-P. Interception of Heat Rays With the Aid of Metallic Sheets. (In French.) Victor Broida. *Chaleur et Industrie,* v. 32, Dec. 1951, p. 347-352.

Results of a study on the protection of persons and objects against rays from incandescent sources by means of metallic sheets. A mathematical system explaining the theory of this technique. Includes graphs and tables for sheets of brass, bronze, copper, and steel. (P11, A7, Cu, ST)

83-P. Theory of Holes in Liquids. Calculation of the Variation of Volume During Melting. (In French.) Genevieve Sutra. *Comptes Rendus hebdomadaires des Séances de l'Académie des Sciences,* v. 233, Nov. 12, 1951, p. 1186-1187.

A method of calculating the variation of volume during melting comparing this variation with the total volume of the holes. Data for volumetric and energy factors of Ag, Al, Zn, Na, Ga, Hg, Ne, and A are tabulated.
(P10, Ag, Al, Zn, Ga, Hg)

84-P. Resistance Anomalies of a Highly Permeable Nickel-Iron-Molybdenum Alloy. (In German.) Fritz Assmus and Friedrich Pfeifer. *Zeitschrift für Metallkunde,* v. 42, Oct. 1951, p. 294-299.

Experiments on an alloy containing 79% Ni, 5% Mo, remainder Fe. Results of various heat treatments. 16 ref. (P15, P16, Ni)

85-P. The Ferromagnetic Faraday Effect at Microwave Frequencies and Its Applications. The Microwave Gyrator. C. L. Hogan. *Bell System Technical Journal,* v. 31, Jan. 1952, p. 1-31.

A new microwave circuit element dependent on the Faraday rotation of a polarized wave was developed. Polder's analysis was extended to include a wave being propagated through a ferromagnetic substance with dielectric and magnetic loss; results give experimental verification of the theory. Experimental technique may also be of some interest in studying the properties of ferrites at microwave frequencies. 12 ref. (P16)

86-P. Development of Thermocouples for Use on Thermoelectric Generators. *Franklin Institute, Quarterly Progress Report* P-2205-4, 1951, 10 pages.

Summarizes work on a program of theoretical and experimental research conducted for the purpose of improving understanding of the thermo-electric properties of materials and of developing a thermocouple of improved efficiency for use in thermo-electric generators. Concerned principally with the development of processes for quantity production of Zn-Sb thermocouple elements and suitable means for soldering or fusing these elements to constantan. Preparation and thermo-electric properties of PbS were investigated. Attention was given to problems involved in transfer of heat from the source to the hot junctions.
(P15, Zn, Sb, Cu, Ni)

87-P. Contact Potential Variations on Freshly Condensed Metal Films at Low Pressures. Leland L. Antes and Norman Hackerman. *Journal of Applied Physics,* v. 22, Dec. 1951, p. 1395-1398.

The reason for contact differences of potential. Results indicate characteristically different behavior for each of the six metals studied. Electrical resistance measurements made on similar metal films under similar conditions are correlated with contact potential measurements. Studies were made on Al, Cu, Au, Ni, Fe and Cr.
(P15, Al, Cu, Au, Ni, Fe, Cr)

88-P. Volta Potentials of the Copper-Nickel Alloys and Several Metals in Air. Herbert H. Uhlig. *Journal of Applied Physics,* v. 22, Dec. 1951, p. 1399-1403.

Volta potentials can reliably and consistently differentiate between many metals of the periodic table. Also, effects of electronic interaction between Ni and Cu in alloys of these metals can be detected and reproduced. The Volta potential, as usually measured, is an average of surface phases weighted in accord with the area of each phase exposed.
(P15, Ni, Cu)

89-P. Dimensional Changes Normal to the Diffusion Direction. R. W. Balluffi and B. H. Alexander. *Journal of Metals,* v. 4, Feb. 1952, p. 146.

Experiments on diffusion of Ag into Au showed that normal expansion is not caused by grain-boundary diffusion. Normal percentage expansion was found to be over half of the parallel percentage expansion in polycrystalline wires.
(P10, N1, Ag, Au)

90-P. Low Melting Gallium Alloys. R. M. Evans and R. I. Jaffee. *Journal of Metals,* v. 4, Feb. 1952; *Transactions of American Institute of Mining and Metallurgical Engineers,* v. 194, 1952, p. 153-156.

Investigation of properties. Includes effects of binary additions on the melting point of Ga, and its corrosive action on other metals and alloys. Phase diagrams. Data are tabulated for Ga-Sn-Zn and Ga-Sn-Zn-Al alloys. (P12, M24, R6, Ga)

91-P. Silicon-Oxygen Equilibrium in Liquid Iron. Nevzat A. Gokcen and John Chipman. *Journal of Metals,* v. 4, Feb. 1952; *Transactions of American Institute of Mining and Metallurgical Engineers,* v. 194, 1952, p. 171-181.

Molten Fe-Si-O alloys in silica crucibles were brought into equilibrium with atmospheres of controlled H_2O/H_2 ratio, quenched in hydrogen, and analyzed. Rates of oxidation and reduction were studied in experiments lasting up to 16 hr. at 1600° C. The rate-determining part of the process is the transfer of oxygen from gas to metal or the reverse which, under the experimental conditions, was about 20% efficient. 21 ref. (P12, D general, Fe, ST)

92-P. Effect of Cold Work and Annealing on the Thermoelectric Power of Molybdenum. J. Howard Kittel. *Journal of Metals,* v. 4, Feb. 1952; *Transactions of American Institute of Mining and Metallurgical Engineers,* v. 194, 1952, p. 196.

Data on the investigation are graphed. (P15, J23, Mo)

93-P. A Two Fluxmeter Method of Measuring Ferromagnetic Hysteresis Loss. H. Aspden. *Journal of Scientific Instruments,* v. 29, Jan. 1952, p. 5-7.

A method for measuring hysteresis loss without recourse to complicated devices and special instruments. It is as accurate as any other method and is simple to operate. (P16)

94-P. Heat Treatment in Magnetic Field. *Metal Progress,* v. 61, Jan. 1952, p. 106-107. (Condensed from "Iron-Silicon Alloys Heat Treated in a Magnetic Field," Matilda Goertz.)

Previously abstracted from *Journal of Applied Physics.* See item 241-P, 1951. (P16, J23, Fe, SG-n, p)

95-P. On θ Values in the Resistance of Metals. P. G. Klemens. *Proceedings of the Physical Society,* v. 65, sec. A, Jan. 1952, p. 71-72.

Relation to temperature. (P15)

96-P. A Ferromagnetic Hysteresis Potentiometer. Harold Aspden. *Review of Scientific Instruments,* v. 22, Dec. 1951, p. 869-871.

Construction principles and method of operation. (P16)

97-P. Magnetization Hysteresis Loop Tracer for Long Specimens of Extremely Small Cross Section. E. C. Crittenden, Jr., A. A. Hudimac, and R. I. Strough. *Review of Scientific Instruments,* v. 22, Dec. 1951, p. 872-877.

An instrument for measurement of the low-frequency magnetic properties of thin layers. (P16)

98-P. On the Abnormality in the Thermal Expansion of Iron-Platinum Alloys. (In English.) Hakaru Masumoto and Takeo Kobayashi. *Science Reports of the Research Institutes, Tohoku University,* sec. A, v. 2, Dec. 1950, p. 856-860.

Measurements on the thermal expansion of binary alloys of Fe and Pt were carried out, and it was found that the alloys containing 52.5-53.5% Pt have, at near room temperature, negative coefficients of expansion. (P11, Fe, Pt)

99-P. The Densities of Nickel-Cobalt Alloys. (In English.) Mikio Yamamoto. *Science Reports of the Research Institutes, Tohoku University,* sec. A, v. 2, Dec. 1950, p. 871-877.

The density vs. composition relationships for the γ-phase and ε-phase alloys are expressed by equations. Data are tabulated and graphed. 11 ref. (P10, AY)

100-P. On the Mechanism of Magnetic After-Effect of a Ferromagnetic Substance. (In English.) Seiziro Maeda. *Science Reports of the Research Institutes, Tohoku University,* sec. A, v. 2, Dec. 1950, p. 878-889.

A theory for the magnetic after-effect was proposed, taking into account the irreversible displacement of the domain boundaries in a ferromagnetic substance. According to the theory, the characteristic nature of the after-effect does not change within wide ranges of magnetic field, tension applied, and temperature. A simple formula for approach to equilibrium in magnetization was given on the basis of the theory. (P16)

101-P. Absorption of Nitrogen by Molten Iron Alloys. III. Study on Fe-C and Fe-Si Alloys. (In English.) Tunezo Saito. *Science Reports of the Research Institutes, Tohoku University,* sec. A, v. 2, Dec. 1950, p. 909-916.

The absorption phenomena of nitrogen by molten Fe-C and Fe-Si alloys was studied. (P12, Fe, ST)

102-P. Conductivity and Some Other Electric Properties of Thoria in a Vacuum. (In French.) G. Mesnard and R. Uzan. *Vide,* v. 6, July-Sept. 1951, p. 1052-1062; Nov. 1951, p. 1091-1097.

Experimental tubes used in measuring electrical conductivity of thoria; processes used for measuring resistance, thermo-electric emf., and thermal conductivity; and re-

sults obtained. Part II: Thermo-electric and commutation effect, and activation by the passage of current. Charted data and diagrams. 21 ref. (P15)

103-P. Thermomagnetic Analysis. (In German.) H. Merkel. *Chemie-Ingenieur-Technik,* v. 23, Dec. 21, 1951, p. 570-575.

The principles of ferromagnetism and of magnetic scales. Directions for performing the measurements; alloys and catalysts, especially for Fischer-Tropsch synthesis, are cited as examples of application of thermomagnetic analysis. Diagrams, graphs, and tables. 15 ref. (P16, SG-n,p)

104-P. A Ferromagnetic Phase in the Nickel-Manganese-Antimony System. (In German.) L. Castelliz. *Monatshefte für Chemie und verwandte Teile anderer Wissenschaften,* v. 82, Dec. 15, 1951, p. 1059-1085.

A number of Ni-Mn-Sb alloys were radiographically investigated, and their saturation magnetization and Curie temperatures measured. Magnetic momenta of the atoms were computed. Tables, graphs, and X-ray diagrams. 14 ref. (P16, Ni, Mn, Sb)

105-P. The Temperature Dependence of Magnetic Strength of Ferromagnetic Metals. (In Russian.) E. F. Kuritsyna. *Doklady Akademii Nauk SSSR,* new ser., v. 79, July 11, 1951, p. 233-236.

Magnetic strengths were determined experimentally from 86 to 1013° K. for Fe and from 86 to 1073° K. for Co. Results are charted. (P16, Fe, Co)

106-P. Seignette-Electric (Ferroelectric) Theory. (In Russian.) G. A. Smolenskii and R. E. Pasynkov. *Doklady Akademii Nauk SSSR,* new ser., v. 79, July 21, 1951, p. 431-434.

A theoretical analysis is made of the ferro-electric effect at the Curie point. Results are compared with experimental data. (P15)

107-P. Resistivity of Single-Phase Monovalent Metals. (In Russian.) N. V. Grum-Grzhimailo. *Doklady Akademii Nauk SSSR,* new ser., v. 79, July 21, 1951, p. 461-462.

The electrical resistivity of Au-Ag and Ca-Rb alloys was investigated. Results are charted. (P15, Au, Ag, Ca, Rb)

108-P. Energy of Dissociation of Copper Arsenide. (In Russian.) M. E. Kochnev. *Doklady Akademii Nauk SSSR,* new ser., v. 79, July 21, 1951, p. 463-465.

The energy of dissociation of Cu-As alloys in relation to temperature was studied and compared with the equilibrium diagram of the system. Data are tabulated and charted. (P12, M24, Cu, As)

109-P. Thermodynamics of the Iron-Carbon System. (In Spanish.) Francisco Munoz del Corral. *Instituto del Hierro y del Acero,* v. 4, Jan.-Mar. 1951, p. 52-61; Apr.-June 1951, p. 131-136.

On the basis of existing methods of determining the activity of C in different forms of steel, and using extrapolation methods, a coherent thermodynamic interpretation of the Fe-C system was developed. Information is presented on the free energy of formation of cementite from the different allotropic forms of iron. Influence of Si and Mn on carbon activity was investigated. Data are tabulated. 38 ref. (P12, N8, Fe, ST)

110-P. Optical Properties of Surface Films. Alexandre Rothen. *Annals of the New York Academy of Sciences,* v. 53, July 20, 1951, p. 1054-1063.

Optical phenomena occurring on reflection of light from a metallic surface coated with a film, and especially their application to determination of thickness of the film. (P17)

111-P. Measurement of Properties of Thin Films on Chromium by the Reflection of Polarized Light. J. B. Bateman and Margaret W. Harris. *Annals of the New York Academy of Sciences,* v. 53, July 20, 1951, p. 1064-1081.

Results of polarization measurements on aliphatic-acid layers transferred to chromium by the Blodgett method. The data were obtained in order to determine the conditions most favorable to the precise simultaneous measurement of thickness and refractive index. 17 ref. (P17, Cr)

112-P. Laboratory Measurement of Iron Losses at Audio Frequencies. C. C. Horstman and A. Lucic. *ASTM Bulletin,* Jan. 1952, p. 64-66.

An instrument for laboratory testing of core material for iron-core inductor components at frequencies higher than 60 cycles. The equipment and the operational details of the instrument and special requirements for obtaining accuracy and reliability in these higher frequency measurements. (P15, Fe, SG-p)

113-P. An Interferometric Method for the Determination of the Absorption Coefficients of Metals, With Results for Silver and Aluminum. L. G. Schulz. *Journal of the Optical Society of America,* v. 41, Dec. 1951, p. 1047-1051.

The method utilizes the change in phase accompanying the reflection of light at normal incidence. The reflecting layers in an interference filter are made of the metal being studied. From the optical thickness of the dielectric between the reflecting layers and the wave length of the light transmitted, the phase change can be calculated. 13 ref. (P17, Ag, Al)

114-P. A Note on the Adiabatic Thermomagnetic Effects. Herbert B. Callen. *Physical Review,* ser. 2, v. 85, Jan. 1, 1952, p. 16-19.

The thermodynamic theory of transverse adiabatic thermomagnetic effects is extended, and the final complete set of thermodynamic relations among all thermomagnetic effects is summarized. (P12)

115-P. The Magnetic Susceptibility of Uranium. C. J. Kriessman, Jr., and T. R. McGuire. *Physical Review,* ser. 2, v. 85, Jan. 1, 1952, p. 71-72.

Using a body-force method, magnetic susceptibility was measured as a function of temperature. Results are charted and compared with those of other investigators. 12 ref. (P16)

116-P. Superconductivity of Vanadium. Aaron Wexler and William S. Corak. *Physical Review,* ser. 2, v. 85, Jan. 1, 1952, p. 85-90.

The magnetic properties exhibited by most specimens of the so-called hard superconductors are due to internal strain arising from either mechanical work or interstitially located impurities such as C, N_2, and O_2. The very large effects of small concentrations of these impurities on the superconductive properties can be understood on this basis. 30 ref. (P15, P16, V)

117-P. Magnetic Properties of a Hollow Superconducting Lead Sphere. Julius Babiskin. *Physical Review,* ser. 2, v. 85, Jan. 1, 1952, p. 104-106.

Studied by measuring the magnetic field distributions along the equatorial plane with bismuth probes. After cooling in the absence of a magnetic field, the hollow sphere was found to be a perfect magnetic shield in the superconducting state. (P16, Pb)

118-P. A Cryoscopic Study of the Solubility of Uranium in Liquid Sodium at 97.8° C. Thomas B. Douglas. *U. S. Atomic Energy Commission,* AECD-3254, Mar. 12, 1951, 8 pages.

With an average reproducibility of approximately ±0.001° C., measurements were made of equilibrium temperatures at various stages of melting from 70 to 100% complete, of three samples of Na. One sample contained U in bulk form and one sample contained finely divided U. (P13, U)

119-P. (Book) Textbook of Electrochemistry. Vol. I and II. G. Kortüm and J. O'M. Bockris. 882 pages. 1951. Elsevier Publishing Co., 445 Park Ave., New York.

Emphasis is on a clear understanding of fundamental principles. Important recent advances in the field are covered. Footnote references. (P15)

Q

MECHANICAL PROPERTIES AND TEST METHODS; DEFORMATION

163-Q. Rolling Textures in Face-Centered Cubic Metals. Hsun Hu, P. R. Sperry, and Paul A. Beck. *Journal of Metals,* v. 4, Jan. 1952; *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 194, 1952, p. 76-81.

Quantitative pole figures were determined for both the internal texture and the surface texture of highly rolled 2S Al, tough-pitch Cu, and commercial 70-30 brass strips with two different rolling procedures: rolled in the same direction in successive passes, and rolled by reversing the strip end to end between successive passes. Results are diagrammed. 15 ref. (Q24, Al, Cu)

164-Q. A Preliminary Study of the Oxidation and Physical Properties of TiC-Base Cermets. Clinton C. McBride, Harold M. Greenhouse, and Thomas S. Shelvin. *Journal of the American Ceramic Society,* v. 35, Jan. 1, 1952, p. 28-32.

The TiC-base cermets investigated contained Cr, Fe, Co, Ni, NiAl, ferrosilicon, or duriron as the metallic constituent. They were evaluated on the basis of strengths at 75 and 1800° F., oxidation resistance at 2000° F., and degree of chemical reaction between carbide and metal as determined metallographically. Metallographic and X-ray studies were conducted on the oxide layers to determine a qualitative mechanism of oxidation. Results indicate TiC plus NiAl to be the most promising composition and oxygen diffusion to be the governing factor in the oxidation of the cermets studied. (Q23, R2, M27, Ti, C-n)

165-Q. Creep and Stress-to-Rupture Properties of Pressure Vessel Steels. R. D. Wylie and H. Thielsch. *Welding Journal,* v. 31, Jan. 1952, p. 11s-19s; disc. p. 19s-26s.

An interpretive engineering statement. Effect of fabrication processes on steels used in pressure vessels. Data are tabulated and graphed. 15 ref. (Q3, Q4, ST)

166-Q. Dimensional Effects in Fracture. C. W. MacGregor and N. Grossman. *Welding Journal,* v. 31, Jan. 1952, p. 20s-26s.

Influence of size on the transition temperature from ductile to brittle fracture, the effect of various ratios of combined stresses on the brittle transition temperature, and the effect of combined stresses on fracture strength. Material tested was Ryerson VD (0.95% C) toolsteel. Graphs and micrographs. 18 ref. (Q26, TS)

167-Q. Power Plant Piping. Hugh Welshman, Jr. *Heating, Piping & Air Conditioning,* v. 24, Jan. 1952, p. 135-142.

A detailed discussion of piping

systems, design, manufacture, fabrication, installation and operation. Tabular data on mechanical properties and other specifications for ferrous metals and alloys used in various locations. (To be continued.)
(Q general, S22, T25, CN, AY)

168-Q. Rare Earths Increase High Temperature Properties of Magnesium. K. Grube. *Iron Age,* v. 169, Jan. 17, 1952, p. 102-105.

Additions of Misch metal up to 2% increase the creep resistance of Mg extrusion alloys. Ni and Mn also improve high-temperature properties at 600° F. A fluosilicic acid treatment gives these Mg alloys good protection against oxidation up to 700° F. 3-in. billets extruded to ¾ in. were tested. Tabulated and illustrated data. (Q3, Mg, SG-h)

169-Q. Wearproofing Machine Elements. Paul B. Berlien. *Machine Design,* v. 24, Jan. 1952, p. 123-126.

Use of cemented carbides for wearproofing basic machine parts. Examples of this application as well as data on how the carbide is applied. (Q9, SG-m, C-n)

170-Q. Mechanical and Corrosion Tests of Spot-Welded Aluminum Alloys. Fred M. Reinhart, W. F. Hess, R. A. Wyant, F. F. Winsor, and R. R. Nash. *National Advisory Committee for Aeronautics,* Technical Note 2538, Dec. 1951, 74 pages.

Panels were fabricated from 24S-T3, Alclad 24S-T3, R-301-T6, XB75S-T6, and Alclad XB75S-T6, all of 0.040-in. thickness; and R-301-T6 of 0.020-in. thickness. Conditions of exposure and protective effect of adjacent cladding were such that the localized corrosion did not proceed to a point where it affected the shear strength of the welds. Data are tabulated. Micrographs.
Q2, R general, K3, Al)

171-Q. Fundamental Effects of Cold-Work on Some Cobalt-Chromium-Nickel-Iron Base Creep-Resistant Alloys. D. N. Frey, J. W. Freeman, and A. E. White. *National Advisory Committee for Aeronautics,* Technical Note 2586, Jan. 1952, 12 pages.

The influence of cold working on the creep properties of an alloy containing 20% Co, 20% Cr, 20% Ni, and the balance Fe and on the same alloy modified by small additions of W alone or W, Mo, and Cb in combination was studied. Effects of cold working on creep resistance were similar for all the alloys studied.
(Q3, AY)

172-Q. Creep Under Complex Stress Systems at High Temperatures. A. E. Johnson. *Aircraft Engineering,* v. 24, Jan. 1952, p. 6-16.

The materials studied were a cast 0.17% C steel, an Al alloy (R.R.59), a Mg alloy (containing 2% Al), and a Ni-Cr alloy (Nimonic 75). Each material was tested at temperatures within its normal working range. Data are tabulated and graphed.
(Q3, CN, Al, Ni, Cr, Mg)

173-Q. Growth Twins in Cadmium. D. S. Oliver. *Research,* v. 5, Jan. 1952, p. 45-46.

Mechanism of formation. (Q24, Cd)

174-Q. Fatigue of Steels; Data on Fatigue and Their Application to Design. *Automobile Engineer,* v. 42, Jan. 1952, p. 35-40. (Based on "The Fatigue Strength of Steels", by R. J. Love.)

The nature of fatigue and the nature of presentation of data. Application of data such as S-N diagrams and Goodman diagrams to design.
(Q7, ST)

175-Q. Use of Wire-Resistance Strain-Gauges in Automobile Engineering Research, With Particular Reference to the Measurement of Strain in Vehicle Structures. J. R. Bristow, P. Metcalf, and C. H. G. Mills. *Institution of Mechanical Engineers, Proceedings,* Automobile Div., pt. 2, 1950-51, p. 27-37; disc. p. 37-47.

Sphere of usefulness and limitations of wire resistance strain gages, and factors affecting accuracy and stability. Determination of static strain, using a simple bridge and galvanometer method. Dynamic strain determination with reference to measurements made on the frame and superstructure of a double-deck public service vehicle under road conditions; typical strain records.
(Q25)

176-Q. Round-Up on Titanium. II. A Review of Mining Methods. *South African Mining and Engineering Journal,* v. 62, pt. 2, Dec. 29, 1951, p. 777-779.

Includes tabular data on mechanical and physical properties of Ti, Mg, Al, Fe, and Cu.
(Q general, P general, Ti, Mg)

177-Q. Influence of Low-Temperature Heat Treatment on Creep Resistance. (In French.) Georges Delbart and Michel Ravery. *Comptes Rendus hebdomadaires des Séances de l'Académie des Sciences,* v. 233, Dec. 3, 1951, p. 1455-1457.

Long-time aging of a steel containing 0.12% C, 0.6% Cr, and 0.6% Mo was studied at 450 and 575° C., showing that it has a favorable influence on creep resistance of a series of phases: ferrite-pearlite; higher ferrite-bainite; ferrite-bainite-sorbite; two sorbites; and three lower bainites. (Q3, J27, AY)

178-Q. Strength of Contact Surfaces of Steel Spur Gears. (In German.) *Zeitschrift des Vereines Deutscher Ingenieure,* v. 93, Nov. 21, 1951, p. 1050-1053.

Test results, particularly influence of gear profile. Charts and diagrams.
(Q23, T7, ST)

179-Q. The Effect of the Smoothness of the Working Surface on the Resistance to Rupture Caused by Single and Repeated Impact. (In Russian.) G. I. Pogodin-Alekseev and A. V. Pamfilov. *Stanki i Instrument,* v. 22, Apr. 1951, p. 22-23.

See abstract from *Engineer's Digest;* item 677-Q, 1951. (Q6, ST)

180-Q. Machine for Wear Testing Gage Materials. (In Russian.) A. L. Chestnov. *Stanki i Instrument,* v. 22, Apr. 1951, p. 23-25.

Machine is described, diagrammed, and illustrated. (Q9)

181-Q. Properties of Spinning Pins. (In Japanese.) Kunio Futaki. *Journal of Mechanical Laboratory,* v. 5, Sept. 1951, p. 217-220.

Refers to pins used in spinning machines. Present mechanical-test methods and their drawbacks. Suggests microbend test apparatus and procedure for this application. Diagram and graphs. (Q5, ST)

182-Q. The Micro Bending Test Machine. (In Japanese.) Kunio Futaki. *Journal of Mechanical Laboratory,* v. 5, Sept. 1951, p. 221-224.

Apparatus designed for testing of spinning-machine pins. Typical data are charted and tabulated. (Q5, ST)

183-Q. The Effect of Wear of the Several Metals Against Clay Particles. (In Japanese.) Tamaki Watanabe. *Journal of Mechanical Laboratory,* v. 5, Sept. 1951, p. 225-230.

Results of investigation for various ferrous and nonferrous metals and alloys, especially Ni, Fe, Cu, and Al. Tables and graphs.
(Q9, Ni, Fe, Cu, Al)

184-Q. Vanadium Steels for Castings; Higher Tensile and Impact Strengths. *Alloy Metals Review,* v. 8, Dec. 1951, p. 2-6.

Surveys these properties. Data are tabulated. (Q27, Q6, AY)

185-Q. Microhardness Testing. D. L. Paterson. *Canadian Metals,* v. 15, Jan. 1952, p. 46, 48, 50-51.

How case depths, weld boundary zones, and small components may all be accurately evaluated by means of microhardness tests. (Q29)

186-Q. Heat-Resisting Alloys for Use in Jet Engines. *Industrial Heating,* v. 19, Jan. 1952, p. 48, 50, 154.

Facilities at International Nickel research laboratory for conducting tests on alloys for high-temperature applications. Research includes creep and stress-rupture tests as well as heat treatment studies.
(Q3, Q4, J general, SG-h)

187-Q. Steam Piping for High Pressures and High Temperatures. R. W. Bailey. *Institution of Mechanical Engineers, Proceedings,* v. 164, No. 3, 1951, p. 324-335; disc., p. 336-350.

Distribution of stress in pipes, the accompanying creep, and their application to the rational and economical design of steam piping; the determination of permissible working stress; differences in American and British procedures and consequent differences in stress magnitudes. Tentative considerations of behavior of ferritic and austenitic steels, and the action of creep at operating pressure and temperature in reducing and removing the initial thermal expansion loading of a pipeline, and in imposing it fully when cold. Deals with the problem of making a joint between ferritic and austenitic steel piping and components, and factors of materials and corrosion.
(Q3, K general, R general, SS, SG-g, h)

188-Q. Conservation of Steel by Design. O. W. Irwin. *Journal of the American Concrete Institute,* v. 23, Jan. 1952; *ACI Proceedings,* v. 48, 1952, p 373-378.

Suggestions for saving steel in reinforced concrete design. Inconsistencies in steel stresses. Recommends that tensile unit stress be 60% of the minimum yield point. (Q27, ST)

189-Q. The Crystallographic Aspect of Slip in Body-Centered Cubic Single Crystals. II. Interpretation of Experiments. A. J. Opinsky and R. Smoluchowski. *Journal of Applied Physics,* v. 22, Dec. 1951, p. 1488-1492.

A new method for determining the ratios of critical shear stresses was applied to data taken from the literature and to original results. Measurements of yield strength were found to be not too satisfactory for the investigation of the slip behavior of body-centered cubic materials. On the other hand, any method which determined the slip plane and the orientation of the tensile axis gave useful results. Graphs and charts.
(Q24)

190-Q. Deformation of Body-Centered Cubic Metals. E. A. Calnan, and C. J. B. Clews. *Journal of Applied Physics,* v. 22, Dec. 1951, p. 1508.

Discusses recent results of Opinsky and Smoluchowski. Operative slip systems for unequal and equal critical shear stresses are shown in diagrams. (Q24)

191-Q. Mechanism of Plastic Flow in Titanium. F. D. Rosi, C. A. Dube, and B. H. Alexander. *Journal of Metals,* v. 4, Feb. 1952, p. 145-146.

The plastic behavior of Ti was investigated at room temperature in deformed coarse-grained sheet specimens (grains 2-6 mm. in diam.), produced by a modification of the strain-anneal technique. Determination of slip and twinning planes was based on use of a stereographic plot of a back-reflection Laue photograph describing the region where slip and twinning were observed.
(Q24, Ti)

192-Q. Embrittlement of High Chromium Ferritic Stainless Steels at 475° C. A. J. Lena and M. F. Hawkes. *Journal of Metals,* v. 4, Feb. 1952, p. 146.

These steels, when heated in or slowly cooled through the range 425-525° C., show a complete loss of ductility. This embrittlement was investigated by single-crystal X-ray methods, metallographically, and by changes in physical and mechanical properties. (Q23, SS)

193-Q. Deformation of Ferrite Single

Crystals. F. L. Vogel, Jr., and R. M. Brick. *Journal of Metals,* v. 4, Feb. 1952, p. 147.

The mechanism and critical resolved shear stresses for deformation of ingot-iron single crystals were studied between −70 and +200° C. (Q24, Fe)

194-Q. Slip & Twinning in Single Crystals of Beryllium. H. T. Lee and R. M. Brick. *Journal of Metals,* v. 4, Feb. 1952, p. 147-148.

The critical resolved shear stress for basal slip in Be single crystals under compression was measured at different temperatures in the range from room temperature to 500° C. In these studies, the basal plane was 20-70° from the stress axis. (Q24, Be)

195-Q. Anelastic Studies of the Effects of Nitrogen in Molybdenum. R. Maringer and G. T. Muehlenkamp. *Journal of Metals,* v. 4, Feb. 1952, p. 149.

Internal-friction tests were made. Molybdenum wire, impregnated with N_2, is inserted as the suspension of a torsion pendulum and oscillated at low frequencies. A stable peak was observed in the internal friction vs. temperature curve at 1300° F. and a frequency of 1 cycle per sec. (Q22, Mo)

196-Q. Orientations in Annealed, Very Large-Grained Aluminum. R. G. Treuting and W. C. Ellis. *Journal of Metals,* v. 4, Feb. 1952, p. 150.

In 2S Al, annealed after rolling to 0.027 in. thickness, a very large and widely varying grain size was developed, with grains from less than ⅛ in. to over 2 in. across and an average area of 1 sq. in. (Q24, Al)

197-Q. Intercrystalline Failure of Metals at Elevated Temperatures. O. C. Shepard. *Journal of Metals,* v. 4, Feb. 1952, p. 151.

Stress-rupture tests were made on commercial metals in inert gases and air; and on pure gold in air and in vacuum. (Q4, Au)

198-Q. Effect of Cold Deformation and Annealing on Young's Modulus of Metals. M. E. Fine and N. T. Kenney. *Journal of Metals,* v. 4, Feb. 1952, p. 151-152.

Specimens of Al (2S), Cu (OFHC) and Fe (Armco and electrolytic) were studied. A dynamic method of measurement was used, the maximum strains being in the range of $1x10^{-7}$ to $1x10^{-4}$. (Q21, Fe, Cu, Al)

199-Q. Cast Molybdenum of High Purity. G. W. P. Rengstorff and R. B. Fischer. *Journal of Metals,* v. 4, Feb. 1952; *Transactions of American Institute of Mining and Metallurgical Engineers,* v. 194, 1952, p. 157-160.

A study was made of the effect of impurities on the bend ductility of cast molybdenum. High-purity Mo was prepared by remelting under high vacuum. The ductility of "transverse-grain" specimens indicated that intergranular brittleness decreased with an increase of purity of the metal. (Q23, Mo)

200-Q. Internal Friction Measurements on Iron Wires of Commercial Purity. Ake Josefsson and Eric Kula. *Journal of Metals,* v. 4, Feb. 1952; *Transactions of American Institute of Mining and Metallurgical Engineers,* v. 194, 1952, p. 161-165.

The internal friction method of determining carbon and nitrogen in solid solution in α iron was applied to some steels of commercial purity. The presence of impurities, such as Mn and perhaps P, changed the position of the internal-friction curve for nitrogen and broadened it. Micrographs. (Q22, Fe)

201-Q. Tensile Properties of Wrought Austenitic Manganese Steel in the Temperature Range From +100° to −196° C. H. C. Doepken. *Journal of Metals,* v. 4, Feb. 1952; *Transactions of American Institute of Mining and Metallurgical Engineers,* v. 194, 1952, p. 166-170.

Flow and fracture stresses, as well as conventional properties, were determined. Ductility and related properties, such as fracture stress, decreased continuously with temperature. Peculiarities during straining indicated possible martensite formation or mechanical twinning. 13 ref. (Q27, AY)

202-Q. Dislocation Collision and the Yield Point of Iron. A. N. Holden. *Journal of Metals,* v. 4, Feb. 1952; *Transactions of American Institute of Mining and Metallurgical Engineers,* v. 194, 1952, p. 182-188.

Studies of the above extend the dislocation mechanism to account for localized cataclysmic flow by a dislocation-collision process and provide experimental evidence to support such a process. Only the yielding of iron containing carbon is discussed, although other metal-solute systems are known to behave similarly. 20 ref. (Q24, Q23, Fe)

203-Q. Delay Time for the Initiation of Slip in Metal Single Crystals. I. R. Kramer and R. Maddin. *Journal of Metals,* v. 4, Feb. 1952; *Transactions of American Institute of Mining and Metallurgical Engineers,* v. 194, 1952, p. 197-203.

Single crystals of α-brass, aluminum, and β-brass were studied. A delay time for slip was found in β brass when the specimens were tested below room temperature; however, one was not found for α brass or Al. A general theory of the existence of the brittle transition temperature is proposed. 13 ref. (Q24, Cu, Al)

204-Q. How to Select Steels for Low Temperature Service. John L. Everhart. *Materials & Methods,* v. 35, Jan. 1952, p. 75-79.

Metallurgical and mechanical factors. Melting procedure, chemical composition, finishing temperature for hot rolling, internal structure, grain size, and heat treatment influence the temperature at which the steels become embrittled. Design of the part, presence or absence of notches, restraint, type of loading, size and shape influence the manner of failure. Extensive tabulated data give mechanical properties of various carbon and low-alloy steels at low temperatures, effect of sustained stress, and effect of melting practice on impact strength. 18 ref. (Q general, Q6, Q23, CN, AY)

205-Q. The Working of Metals. (Concluded). W. C. F. Hessenberg. *Metal Industry,* v. 80, Jan. 11, 1952, p. 23-25; Jan. 18, 1952, p. 50-53.

A study of the efficiency of metal deformation processes. Compares use of plasticine and calculated strain patterns. (Q25)

206-Q. Testing Today and Tomorrow. F. G. Tatnall. *Metal Progress,* v. 61, Jan. 1952, p. 64-67.

Follows the course of applications of electronics in testing equipment and tries to forecast how such devices may help attain future needs. Principal emphasis is on strain gages; creep, rupture, and fatigue testing; and nondestructive testing. (Q general, S general)

207-Q. Notch Toughness of Low-Alloy Steels. *Metal Progress,* v. 61, Jan. 1952, p. 156, 158, 160. (Condensed from "Notch-Toughness of Fully Hardened and Tempered Low-Alloy Steel," R. L. Rickett and J. M. Hodge.)

Previously abstracted from *American Society for Testing Materials,* Preprint 31, 1951. See item 335-Q, 1951. (Q6, AY)

208-Q. A Simplified Constant Shear Stress Lever for Creep Tests on Single Crystals. M. Metzger. *Review of Scientific Instruments,* v. 22, Dec. 1951, p. 1022-1023.

A theoretical analysis. Suitable apparatus is diagrammed. (Q3)

209-Q. Elastic Elongation of Chains. L. H. Whitney and P. M. MacDonald. *Product Engineering,* v. 23, Feb. 1952, p. 176-177.

Results of many tests extending over a considerable length of time have been compiled and developed into chart form. These charts are the summation of averages and limits computed for each individual chain size by statistical quality-control methods confined to steel roller, conveyor, and cable chains. (Q23, S12, ST)

210-Q. The Measurement of the Young's Modulus of Metals and Alloys by an Interferometric Method. II. The Influence of Heat Treatment on the Young's Moduli and Densities of Ni-Mn Alloys. (In English.) Tadao Fukuroi and Yoshio Shibuya. *Science Reports of the Research Institutes, Tohoku University,* ser. A, v. 2, Dec. 1950, p. 829-836.

An investigation. Data are graphed and tabulated. (Q21, P10, Ni, Mn)

211-Q. The Effect of the Low-Temperature Annealing Upon the Fibrous Structures of Highly Cold Worked Copper. (In English.) Masayuki Kawasaki. *Science Reports of the Research Institutes, Tohoku University,* ser. A, v. 2, Dec. 1950, p. 861-870.

The fibrous structures developed in Cu, cold drawn as highly as 80% or more, were investigated by X-ray analysis. The most outstanding result was that in the central portion of the wire, the fibrous character was made more evident than in the cold worked state due to annealing at 60° C. for 1 hr. after cold working. These changes are believed to be caused most probably by crystal hardening or strengthening resulting from such crystal reorientation. (Q24, M26, Cu)

212-Q. Nitrogen as the Alloying Element in Steels. I. On the Effect of Nitrogen on the Temper Brittleness in Steels. (In English.) Yunoshin Imai and Tetsuro Ishizaki. *Science Reports of the Research Institutes, Tohoku University,* ser. A, v. 2, Dec. 1950, p. 890-908.

The effect of nitrogen was first examined with the impact test on carbon steels and on low-Mn steels, both containing different amounts of nitrogen. Al and Ti were studied as fixers of nitrogen. From these investigations it was clear that the temper brittleness decreases or almost disappears upon addition of these elements. Data are graphed and tabulated. (Q23, ST)

213-Q. Contribution to the Study of Foundry Brasses. (In French.) Marcel Cirou and Pierre-Julien Le Thomas. *Fonderie,* Dec. 1951, p. 2715-2728.

The influence of additions of P, Si, and Al on mechanical characteristics, structural factors, and castability of Cu-Zn alloys was studied on two types of brasses: one with a Cu content between 70 and 72%, and the other between 59 and 62%. Diagrams, tables, charts, and photomicrographs. (Q general, M27, E25, Cu)

214-Q. Use of the "Alufran" Model-Plate for Tensile-Test Specimens. (In French.) *Fonderie,* Dec. 1951, p. 2746-2747.

Casting procedure. Diagrams. (Q27, E25)

215-Q. Theories of Deformation of Polycrystals. (In French.) Pierre Laurent. *Métaux: Corrosion-Industries,* v. 26, Nov. 1951, p. 433-441.

Various theories concerning stress relief; working effects; homogeneous triaxial strains; influence of rate of deformation; and temperature, creep, and relaxation. Data of various investigators on a wide variety of ferrous and nonferrous metals are tabulated and charted. 17 ref. (Q24, Q25, Q3)

216-Q. New Possibilities in Radiographic Determination of Stresses With the Aid of Short-Wave-Length Radiation. (In French.) Hermann Möller. *Métaux: Corrosion-Industries,* v. 26, Nov. 1951, p. 460-469.

See abstract from *Archiv für das Eisenhüttenwesen;* item 302-Q, 1951. (Q25, ST)

217-Q. Is Mechanical Stress Relief Necessary for the Safety of Welded Pressure Vessels? (In French.) H. Gerbeaux. *Soudure et Techniques connexes.* v. 5, Nov.-Dec. 1951, p. 251-256.

Plastic deformation of the material under severe states of stress, stabilization of successive service cycles, and influence of residual stresses. Concludes that such treatment is usually unnecessary. Schematic diagrams. (Q25, G23, ST)

218-Q. Influence of Bearing Design Upon Load Carrying Capacity and Operational Safety of Bearings. (In German.) Alfred Buske. *Stahl und Eisen,* v. 71, Dec. 1951, p. 1420-1432; disc., p. 1432-1433.

Oil-film pressure and temperature were determined in bearing-test machines with bearings of different design characterized by variation in rigidity of the bearing body and the bushing. Effects of modulus of elasticity of the bearing materials. Diagrams, graphs, and illustrations. (Q23, SG-c)

219-Q. More Recent Development of the "Pasted-On" Electrical Resistance Pickup and Importance of the Wheatstone Circuit as a Measuring Method. (In German.) A. U. Huggenberger. *Schweizer Archiv für angewandte Wissenschaft und Technik,* v. 17, Nov. 1951, p. 321-332.

Modifications of the American SR-4 strain gage, showing diagrams and photographs to illustrate principles and designs. Data are charted and tabulated. (Q25)

220-Q. Some Problems of Heat Resistant Steels From the Standpoint of the Consumer. (In German.) W. Stauffer. *Schweizer Archiv für angewandte Wissenschaft und Technik,* v. 17, Dec. 1951, p. 353-364.

Problems that occur in the construction of steam and gas turbines. Test results for Cr-Mo steels (1% Cr and 1% Mo) and cast Mo steel, including data on creep resistance and on the effect of combustion gases and ash components on these steels. Nondestructive testing of steel castings. Graphs, tables, and photographs. (Q3, R7, T25, AY, SG-g, h)

221-Q. Theory of Dynamic Deformation. (In German.) F. Vitovec and H. Nowotny. *Zeitschrift für Physik,* v. 131, Dec. 1, 1951, p. 41-47.

Dependence of critical shear stresses on rate of deformation as computed by R. Becker's dynamic plasticity equation contradicts most test results. A new equation yields results which agree satisfactorily with most test results. Data are graphed. 17 ref. (Q2)

222-Q. Fatigue Strength of Metals: Notched Parts. (In Italian.) Mirko Ros. *Metallurgia Italiana,* v. 43, Dec. 1951, p. 512-520.

Results of experiments on various steels, pure Al, Al alloys, etc. Data are correlated showing relationship between fatigue limit and notch coefficient (maximum notch stress divided by mean notch stress.) Size and internal-stress effects are also shown. (Q7, ST, Al)

223-Q. Contribution to the Study of Hardness and Strength of Metals. (In Spanish.) Jose Terraza Martorell. *Técnica Metallurgia,* v. 7, Apr. 1951, p. 109-123.

Application of Meyer's law for the relationship between hardness and strength properties of metals was studied theoretically. Results are correlated with data collected from the literature for copper, α brass, aluminum and steel. Graphs, diagrams, and tables. 53 ref. (Q29, Q23, Cu, Al, ST)

224-Q. Brittle and Ductile Fractures; Micromechanism of the Rupture of Metals. (In Spanish.) Rafael Calvo Rodes. *Instituto del Hierro y del Acero,* v. 4, July-Sept. 1951, p. 209-219.

Intergranular and transcrystalline fractures, deformation and rupture of metals, brittleness, and micromechanism of brittle fracture are analyzed theoretically. Diagrams and charts. (To be continued.) (Q26)

225-Q. Elasticity and the Transition Zone of Steels. (In Spanish.) Luis Hurtado Acera. *Instituto del Hierro y del Acero,* v. 4, July-Sept. 1951, p. 220-226.

Factors affecting elasticity and transition temperature. Results of experiments on the relationship between values of elasticity, ductility, and tensile strength. Includes diagrams. (Q21, ST)

226-Q. Iron and Steel Structures. J. L. Beckel, chairman. *American Railway Engineering Association Bulletin,* v. 53, Jan. 1952, p. 507-609.

A committee report including design of expansion joints involving iron and steel structures; stress distribution in bridge frames; design of steel bridge details; preparation and painting of steel surfaces; use of high-strength structural bolts in steel railway bridges; and means of conserving labor and materials, including the adaptation of substitute noncritical materials; and specifications for reclamation of released materials, tools and equipment. (T26, ST)

227-Q. Review of the Fatigue of Materials Field. R. E. Peterson. *Applied Mechanics Reviews,* v. 5, Jan. 1952, p. 1-3.

51 references. (Q7)

228-Q. The Notch Toughness Test of Henri Schnadt. Wendell P. Roop. *ASTM Bulletin,* Jan. 1952, p. 61-64.

Material under compression is removed in such a way that fracture occurs in tension, which is only moderately eccentric. 10 ref. (Q23)

229-Q. Fatigue Tests Under Axial Loads of Aluminum Joints Bonded With a Resinous Adhesive. W. N. Findley, B. A. Century, and C. P. Hendrickson. *ASTM Bulletin,* Jan. 1952, p. 67-71, disc., p. 71.

Single-lap, double-lap, and butt joints were tested in an axial-load fatigue machine. Methods of testing, merits of the three procedures employed, and test results obtained. The fatigue strength at 107 cycles was found to be about three times as large for the butt joints as for the lap joints. Differences in state of combined stress may account for some of the observed differences in test results. (Q7, Al)

230-Q. Pneumatic Fatigue Tester for Metals. *Compressed Air Magazine,* v. 57, Feb. 1952, p. 50.

Developed by General Electric Co. (Q7)

231-Q. Substitutes for Scarce Materials in Spring Design. Frank A. Votta, Jr. *Electrical Manufacturing,* v. 49, Feb. 1952, p. 116-119, 268, 270.

Characteristics of various materials which can be used as substitutes for Type 302 stainless steel and phosphor bronze. Includes mechanical properties. (T7, Q general, SG-b)

232-Q. Shortcomings of Structural Analysis. J. F. Baker. *Engineering,* v. 173, Jan. 11, 1952, p. 57-59; Jan. 18, 1952, p. 92-93.

A detailed discussion including tests made on bars of rolled mild steel. (Q25, CN)

233-Q. Creep-Test Research Station. *Engineering,* v. 173, Jan. 25, 1952, p. 107-108; *Engineer,* v. 193, Jan. 25, 1952, p. 136-137.

Station erected by Imperial Chemical Industries, Ltd., for the study of creep in metals. (Q3)

234-Q. Uses of Ductile Iron Are Increasing. *Industry and Power,* v. 62, Feb. 1952, p. 109-110.

Properties and applications of ductile iron and comparison with malleable iron and cast carbon steel. (Q general, T general, CI)

235-Q. Tin and Copper in Steel: Both Are Bad; Together They're Worse. S. L. Gertsman and H. P. Tardif. *Iron Age,* v. 169, Feb. 14, 1952, p. 136-140.

How tin build-up caused cracks in bend tests at 1825° F. and during hot forming. An argon atmosphere prevents this—except when Sn content is increased. Treatment at 2300° F. also reduces cracking. Deeper surface breaks develop as Cu is increased at a given Sn level and as Sn is increased at a given Cu level. Tables, graphs and micrographs. (Q5, ST)

236-Q. New Method of Determining Endurance Limit of Steel and Other Materials. *Machinery* (American), v. 58, Feb. 1952, p. 153.

Dilastrain method developed at Rensselaer Polytechnic Institute is based on precise measurements of the extent to which specimens of a given material will expand under controlled temperatures. The apparatus is applicable to metals, alloys, or plastics. (Q7)

237-Q. Hard Metal for Wear Resistance. *Machinery Lloyd,* (Overseas Edition), v. 24, Jan. 9, 1952, p. 87-88.

A few of the applications where tungsten carbides have been particularly successful. (Q9, T general, W, C-n)

238-Q. A New Version of "Strength of Materials." Archibald C. Vivian. *Metallurgia,* v. 45, Jan. 1952, p. 29-37.

A new theory based on effects of atomic or lattice changes under metallurgical treatments. The author is extremely critical of generally accepted theories. (Q23, M25, M26)

239-Q. Direct-Reading Design Charts for 75S-T6 Aluminum-Alloy Flat Compression Panels Having Longitudinal Extruded Z-Section Stiffeners. William A. Hickman and Norris F. Dow. *National Advisory Committee for Aeronautics,* Technical Note 2435, Feb. 1952, 60 pages.

The charts cover a wide range of proportions, and make possible direct determination of stress and panel dimensions required to carry a given intensity of loading with a given skin thickness and effective length of panel. (Q25, Al)

240-Q. Fundamental Effects of Cold-Work on Some Cobalt-Chromium-Nickel-Iron Base Creep-Resistant Alloys. D. N. Frey, J. W. Freeman, and A. E. White. *National Advisory Committee for Aeronautics,* Technical Note 2586, Jan. 1952, 12 pages.

The influence of cold working on the creep properties of an alloy containing 20% Co, 20% Cr, 20% Ni and balance Fe; and on the same alloy modified by small additions of W alone or W, Mo, and Cb in combination was studied. Effects were similar for all the alloys studied. Data are graphed. (Q3, Co, Cr, Ni, Fe)

241-Q. Electronic Hammer Forces Metal to Change. *Steel,* v. 130, Feb. 18, 1952, p. 100.

Previously abstracted from "Statitron Will Workharden Aluminum Alloys, Build Forces to Cause Failure, Harden Non-Heat-Treatable Metals, Alter Physical Properties of Metals Instantly", Frank Charity, *American Machinist;* item 305-Q, 1951. (Q25, S13, J general)

242-Q. The Creep and Stress-Rupture Testing of Steam-Boiler Materials. J. B. Romer, and H. D. Newell. *Transactions of the American Society of Mechanical Engineers,* v. 74, Feb. 1952, p. 157-172; disc., p. 172-174.

Significance of the time factor in testing in relationship to long-life,

steam-generating equipment. General effects of metal oxidation from steam and combustion atmospheres. Relative merits of long-time creep tests and stress-rupture tests, and typical test data for each form of test. Suggestions for temperature limits for superheater-tube materials and a resume of field experience on carbon and alloy steels. 32 ref.
(Q3, Q4, R2, CN, AY)

243-Q. It's Steel for Shock Resistance. Earl Obringer and R. C. Montanus. *Welding Engineer,* v. 37, Feb. 1952, p. 27-29, 42.
New design of lathe for shipboard use replaces the major cast-iron components with weldments so as to withstand stresses that include deck weaving and the impact of near misses in bombing.
(Q25, K general, T5, ST)

244-Q. Fatigue Strength of Panels With Welded Angle Stiffeners. R. Weck. *Welding Research,* v. 5, Oct. 1951, p. 219r-249r.
A report of an investigation to determine the life of different types of welded joints in angle stiffeners attached to plates, when subjected to many repetitions of loading. Micrographs and diagrams.
(Q7, K9, ST)

245-Q. (Pamphlet) **Tabla de Tipificacion de los aceros comunes.** (Table of Characteristics of Common Steels.) (In Spanish.) Instituto del Hierro y del Acero, 15 Villanueva, Madrid, Spain. Dec. 1950, 14 pages.
Table is grouped into three parts: bessemer steels, openhearth steels, and steels for particular uses. Compositions, mechanical properties, and applications are listed.
(Q general, CN)

R

CORROSION

60-R. Corrosion. Mars G. Fontana. *Industrial and Engineering Chemistry,* v. 44, Jan. 1952, p. 91A-92A, 94A.
Fifth of a series summarizing corrosion data in chart form. Concentrations and temperatures for corrosion of high Ni-Mo alloy by H_2SO_4.
(R5, Ni, Mo)

61-R. Polyphosphate Detergents in Mechanical Dishwashing. Solubilizing Action of Polyphosphates on Certain Metals. Metallic Staining of Silverware. Leslie R. Bacon and Eugene G. Nutting, Jr. *Industrial and Engineering Chemistry,* v. 44, Jan. 1952, p. 146-155.
The ability of polyphosphates in commercial dishwashing detergents to dissolve Cu, Zn, and brass from dishwashing-machine parts has been responsible for serious operating difficulties. A brassy tarnish on silverware washed in certain machines has been traced to Cu dissolved from the machine. Laboratory corrosion data for many commercial detergent formulas. The difficulties may be overcome by elimination of cuprous metals or strongly electronegative metals such as Zn or Al from the dishwashing system. Highly silicated detergents minimize the problem. (R5, Ag, Cu, Ni, Fe, Zn, Al)

62-R. Tests on Lube Stability vs. Corrosion Show 1000-Mile Oil Change Is a Must. W. F. Weiland. *Petroleum Processing,* v. 7, Jan. 1952, p. 69, 71, 73, 74-75.
Results of tests on lube stability vs. corrosion of engine and bearing metals show that incipient corrosion is definitely related to an acid-vapor temperature of 215° F. or the temperature at which vapors with acid characteristics are liberated in progressive oil breakdown. (R7)

63-R. Graphite Ground Anodes Protect High-Pressure Gas Lines. A. W. Peabody. *Oil and Gas Journal,* v. 50, Jan. 28, 1952, p. 374, 376, 378, 380, 383-384, 386, 388-389.
The cathodic protection program undertaken by Rochester Gas & Electric Corp. against corrosion of a steel pipeline. (R10, ST)

64-R. Silicates in Detergents. E. A. Robinson. *Soap and Sanitary Chemicals,* v. 28, Jan. 1952, p. 34-36.
Use of silicates to inhibit corrosion of light metals, Cu-Zn, Cu-Ni alloys, and vitreous enamels by carbonates, ortho and polyphosphates. (R10, R7, Cu, Zn, Al, Ni)

65-R. Corrosion Problems Arising From Water in Chemical Industry. U. R. Evans. *Chemistry & Industry,* Dec. 31, 1951, p. 1193-1198; disc. p. 1198-1200.
Corrosion and inhibition. Deals mainly with coolers and boilers, although other uses of water such as washing, rinsing, pressure transmission, seals for tanks, and fire extinguishing are mentioned. 53 ref.
(R4)

66-R. Experimental Approach to the Problem of Tuberculation by Waters. R. S. Thornhill. *Chemistry & Industry,* Dec. 31, 1951, p. 1201-1205; disc. p. 1205-1207.
Results of research on corrosion of steel and cast iron by tuberculating water. (R4, ST, CI)

67-R. Corroded Nickel Buckles. H. H. Symonds. *Metal Industry,* v. 79, Dec. 28, 1951, p. 542.
Results of an investigation into the cause of visible rust stains on the elastic web of braces. Corrosion was due to the inadequate thickness of Ni on the buckle, particularly at the teeth. (R11, Ni, ST)

68-R. Report on Investigations Into the Stress-Corrosion Cracking in Welded Gas Mains. *Institution of Gas Engineers* (London), Communication 398, 1951, 31 pages.
Cracks are intercrystalline and typical of other examples of stress-corrosion cracking; they are associated with the welds, and cracking invariably starts from the inside of a main. The cracks are frequently associated with irregularities in the weld bead. A hot nitrate-solution test seemed to be satisfactory for determining relative susceptibility of steels to this form of cracking. Micrographs. (R1, K9, ST)

69-R. Corrosion of Axle Shafts and Propeller Screws of Ships. (In French.) *Circulaire d'Informations Techniques,* v. 8, Dec. 1951, p. 1415-1419.
Corrosion as observed on the "Rex" and the "Normandie"; causes and remedies. Materials include cast irons, carbon and alloy steels, manganese bronzes. (R4, CI, CN, AY, Cu)

70-R. Copper Corrosion of a Circulating Evaporator. (In German.) L. W. Haase. *Metalloberfläche,* ser. A, v. 5, Nov. 1951, p. A170-A171.
Probable reasons for the corrosion. Suggests that addition of sulfurous acid or sulfides in order to eliminate oxygen content of water is the main reason. (R4, Cu)

71-R. Corrosion and Its Control in a Chemical Plant. Clyde W. Day. *Chemical Engineering,* v. 59, Jan. 1952, p. 154-157.
What is being done by the Celanese Corp. at Bishop, Tex. Types of corrosion encountered. (R29)

72-R. National Bureau of Standards Determines Optimum for Cathodic Protection. *Gas Age,* v. 109, Jan. 31, 1952, p. 25, 59-60.
Results of recent study on inhibiting underground corrosion of steel. (R10, ST)

73-R. Cathodic Protection of Underground Piping. *Heating Piping & Air Conditioning,* v. 24, Feb. 1952, p. 96-97.
See abstract of "Potential and Current Requirements for the Cathodic Protection of Steel in Soils". W. J. Schwerdtfeger and O. N. McCorman, *Journal of Research of the National Bureau of Standards.*
See item 380-R, 1951. (R10, ST)

74-R. Hermetic Welding Stops Internal Corrosion. Bernard Gross. *Iron Age,* v. 169, Feb. 7, 1952, p. 142-144.
Process for tubular aircraft structures such as engine mounts. Corrosion prevention is due to the fact that internal surfaces are hermetically sealed against the atmosphere. Methods of testing the welds for corrosion, flaws and complete sealing. (R11, S13, K general)

75-R. The Oxidation of Calcium at Elevated Temperatures. Daniel Cubicciotti. *Journal of the American Chemical Society,* v. 74, Jan. 20, 1952, p. 557-558.
Experimental results are charted and discussed. (R2, Ca)

76-R. Comparison of Corrosion Properties of Zirconium, Titanium, Tantalum, Stellite No. 6 and Type 316 Stainless Steel. *Material & Methods,* v. 35, Jan. 1952, p. 115, 117.
21 references.
(R general, Zr, Ti, Ta, SS, Co, SG-g, h)

77-R. From a Metallurgist's Notebook: Stained Aluminium Kettles. H. H. Symonds. *Metal Industry,* v. 80, Jan. 4, 1952, p. 5-6.
Results of an investigation to determine the cause and remedy of brown stains on Al kettles shipped to Australia and India. Cause was found to be certain conditions of temperature and humidity and not the wrapping. (R3, Al)

78-R. Corrosion. J. C. Rintelen, Jr. *New Mexico Miner,* v. 13, Dec. 1951, p. 5, 14, 17.
Thermodynamic, electrochemical and physical metallurgy standpoint. Variables effecting corrosion rate in various materials. (R1)

79-R. Oriented Chemical Overgrowths and Surface Topography. D. W. Pashley. *Proceedings of the Royal Society,* ser. A, v. 210, Jan. 7, 1952, p. 354-376.
Results of a study of the growth of thin halide tarnish layers on silver crystals. The substrate surfaces were prepared in various ways, so that their topography could be varied. By careful analysis of electron-diffraction patterns from the specimens, it was possible to deduce the true contact planes between Ag and halide for many of the observed orientations of silver halide. 10 ref.
(R2, M26, Ag)

80-R. X-Ray Study of the Action of Oleic Acid on Lead. (In French.) J. J. Trillat and S. Barbezat. *Journal des Recherches du Centre National de la Recherche Scientifique,* no. 16, 1951, p. 18-20.
Influence of temperature, as well as other factors. X-ray diagrams.
(R11, Pb)

81-R. Decomposition of Oxide Films on Metal Surfaces in Acid Vapors and Mechanism of Atmospheric Corrosion. (In German.) W. Feitknecht. *Chimia,* v. 6, no. 1, Jan. 15, 1952, p. 3-13.
Experimental studies show that corrosion is caused by impurities in the air, that corrosion occurs rapidly only above a humidity of about 70%, that Cu is protected by the products of corrosion, and that the product of corrosion of Fe is a hydroxide, while the other metals form normal and basic sulfates or a mixture of sulfate and H_2SO_4. Tables, graphs, and electron micrographs. 34 ref. (R3)

82-R. Chemical and Thermodynamic Principles of the Corrosion of Metals in Aqueous Solution. II. Corrosion of Cadmium in Sodium Chloride Solution. (In German.) W. Feitknecht and E. Wyler. *Helvetica Chimica Acta,* v. 34, Dec. 1, 1951, p. 2269-2278.
Shows that metallic corrosion is the result of the electrochemical

properties of the metal, of the chemical and thermodynamic properties of the products of corrosion, and of changes in concentration of ions in the solution, especially, on the surface of the metal. Data are graphed and tabulated. 14 ref. (R5, Cd)

83-R. Corrosion by Micro-Organisms. (In German.) H. O. Nicolaus. *Zeitschrift des Vereines Deutscher Ingenieure*, v. 94, Jan. 11, 1952, p. 39.

The chemistry of biologically caused corrosion and some effective means of combating it. (R1)

84-R. Electrolytic Activation of Passive Iron in Nitric Acid. (In German.) Klaus J. Vetter. *Zeitschrift für Elektrochemie und angewandte physikalische Chemie*, v. 55, Dec. 1951, p. 675-683.

Experimental procedure and results. Dissolved iron was micro-analytically determined and the function of concentration of HNO_3 was theoretically computed. Diagrams and graphs. 24 ref. (R10, Fe)

85-R. The Question of Corrosion Fatigue. (In Russian.) G. V. Karpenko. *Doklady Akademii Nauk SSSR*, new ser., v. 79, July 11, 1951, p. 287-288.

Rotating-beam fatigue tests were made on steel specimens under various conditions of corrosion. Charted data and typical results. (R1, ST)

86-R. Mechanism of the Protection of Iron Apparatus From Corrosion With the Aid of Inhibitors and Protective Agents. (In Russian.) I. L. Rozenfel'd. *Doklady Akademii Nauk SSSR*, new ser., v. 79, July 21, 1951, p. 471-474.

The corrosion of iron structures in various electrolytes and under various protective conditions was studied. Results are charted.
(R10, Fe, ST)

87-R. Progress in the Prevention of Corrosion. W. H. J. Vernon. *Australasian Engineer*, Dec. 7, 1951, p. 73.

See abstract from *Metal Progress;* item 48-R, 1952. (R10, ST, CI)

88-R. Cathodic Protection in Refineries. *Chemical Age*, v. 66, Jan. 26, 1952, p. 165-167.

Two fundamental approaches are available—use of d.c. supplied from a power source and application of an expendable anode which is corroded in place of the metal to be protected. (R10)

89-R. Effectiveness of Cathodic Currents in Reducing Crevice Corrosion and Pitting of Several Materials in Sea Water. Thomas P. May and H. A. Humble. *Corrosion* (Technical Section), v. 8, Feb. 1952, p. 50-56.

Cathodic protection was successful with Ni, monel and Types 302 and 316 stainless steel in quiet sea water. Types 410 and 430 stainless steels cannot be completely protected by cathodic currents because of the development of hydrogen blisters at current densities below that required for complete protection. Micrographs. (R10, SS, Ni)

90-R. A Field Investigation of Cathodic Protection in Glass Lined and Galvanized Water Heaters. W. A. Deringer and F. W. Nelson. *Corrosion* (Technical Section), v. 8, Feb. 1952, p. 57-64; disc., p. 63-64.

Results show how Mg anodes behave in both of above types of water heaters under a variety of water and performance conditions. Data are tabulated. (R10, ST, Zn)

91-R. The Chemical Resistance of Phenolic and Furfuryl Alcohol Type Coatings. Raymond B. Seymour and Robert H. Steiner. *Corrosion* (Technical Section), v. 8, Feb. 1952, p. 65-68; disc., p. 68.

Spot tests on steel and tin-plate panels, quantitative resistance tests on unsupported films and long-term tests on immersed, coated plummets were run to determine the corrosion and solvent resistance of acid-catalyzed phenolic coatings and acid-catalyzed, polyfurfuryl alcohol coatings. Data are tabulated.
(R11, L26, Sn, CN)

92-R. Some Aspects of Ship Bottom Corrosion. *Corrosion* (Technical Section), v. 8, Feb. 1952, p. 69-88.

A discussion on above paper by Paul Pfield, published in Jan. 1952 issue; see item 45-R, 1952.
(R4, CN, AY)

93-R. Corrosion. Mars G. Fontana. *Industrial and Engineering Chemistry*, v. 44, Feb. 1952, p. 85A-86A, 88A.

Concentrations and temperatures for corrosion of high-Si iron (Duriron) by H_2SO_4. (R5, CI)

94-R. A Study of Rust Preventive Properties of Greases. R. J. Burger, B. Rubin, and E. M. Glass. *Lubrication Engineering*, v. 8, Feb. 1952, p. 21-23, 26-27, 46.

A laboratory procedure using ball bearings which showed good correlation with service results. The investigation included petroleum, diester, Ucon oil, and silicone greases. Several factors influencing the degree of corrosion resistance were investigated. Effect of rust inhibition.
(R10)

95-R. A Critical Look at Salt Spray Tests. F. L. LaQue, *Materials & Methods*, v. 35, Feb. 1952, p. 77-81.

Although widely accepted as a means of measuring the resistance of materials and finishes to corrosive environment, salt-spray tests are still highly controversial and are considered unreliable and misleading by many engineers. 11 ref. (R11)

96-R. New Interleaving Paper for Aluminum Inhibits Water Stain. W. Y. Bleakley and C. C. Lacy. *Materials & Methods*, v. 35, Feb. 1952, p. 176, 178, 180.

Sodium chromate was found to be the most effective chemical compound for the prevention of water stains in stacks of flat Al sheets.
(R10, Al)

97-R. Marine Attack. Clyde Williams. *Monthly Business Review*, v. 34, Feb. 1952, p. 10.

Recent research methods for determining extent of attack by marine organisms, and salt-water corrosion of metals and alloys, including processes devised for counterattack. Protective measures under study include: introducing Cu into wood preservatives, anti-fouling point, corrosion resistant alloys, and dehumidification equipment. (R4)

98-R. How to Combat Heat-Exchanger Corrosion. A. R. Dyer. *Oil and Gas Journal*, v. 50, Feb. 4, 1952, p. 69, 84.

Improved methods of cathodic protection and the development of new alloys appear to be the trend in the struggle against corrosion.
(R10, SG-g)

99-R. Some Corrosion Problems In Petroleum Refineries. John F. Mason, Jr. *Petroleum Engineer*, v. 24, Feb. 1952, p. C10, C13-C14, C16-C18.

An analysis of 15 problems encountered. Each specimen was examined for cracking, pitting, and other forms of local attack. Method of test was in accord with ASTM Recommended Practice for Conducting Plant Corrosion Tests. Metals involved include Ni, stainless, carbon steel, cast iron, Cu, and alloy steels.
(R11, R7, Ni, SS, CN, CI, Cu, AY)

100-R. Corrosion Resistance of Copper-Nickel-Chromium Plated Zinc, Aluminum and Magnesium-Base Die Castings. M. R. Caldwell, L. B. Sperry, L. M. Morse, and H. K. Delong. *Plating*, v. 39, Feb. 1952, p. 142-148, 159-163.

Tests to determine how chromium plated Zn, Al, and Mg-alloy die castings compare as to rate and type of corrosion when exposed to different outside atmospheres; how much plate is required to furnish adequate protection for each; how different alloys of Al compare with each other, and how Watts Ni compares with bright Ni under those conditions. Micrographs. Data are graphed and tabulated.
(R3, L17, Ni, Zn, Al, Mg, Cr)

101-R. (Book) **Report of the Chemistry Research Board With the Report of the Director of the Chemical Research Laboratory for the Year 1950.** 104 pages, 1951. Dept. of Scientific and Industrial Research. His Majesty's Stationery Office, London, England.

The main lines of research in progress include corrosion of metals; high polymers and plastics; new techniques; less common elements including radioactive metals; and purification of organic compounds, particularly those derived from tar and those containing heavy carbon. The laboratory maintains close contact with academic chemistry, the various industries concerned, and with other government organizations with common interests.
(R general, A9)

S

INSPECTION AND CONTROL

78-S. Electronics in the Steel Industry—Past, Present, and Future. H. W. Poole. *Iron and Steel Engineer*, v. 29, Jan. 1952, p. 62-69.

Present applications and practices in this country and abroad, and some future trends. In the steel industry, electronics have been employed in four major fields: power electronics used primarily for power conversion; electronic control; high-frequency electronic heating; and electronic measurements. Examples, of each, particularly power electronics. (S18, ST)

79-S. Stainless Steel Product Standards. George N. Malcolm. *Iron and Steel Engineer*, v. 29, Jan. 1952, p. 70-72.

A step-by-step review of mill processing to attain a specific finish. Covers hot and cold rolling of sheet, plate, or strip; annealing; pickling; and mechanical polishing.
(S22, F23, J23, L10, L12, SS)

80-S. Rapid Analysis Determines Cerium in Steel. Charles Morris Johnson. *Iron Age*, v. 169, Jan. 17, 1952, p. 94-96.

A rapid method of determining the cerium group rare-earth elements in steel, where they are used as additive agents, involves precipitation with dry sodium peroxide powder from the acid sulfate solution. La and Nd are precipitated with the Ce. (S11, ST, Ce)

81-S. How to Identify Chrome Steels Quickly. H. M. Randall. *Petroleum Processing*, v. 7, Jan. 1952, p. 60-61.

A simple and rapid field test for identifying corrosion resistant alloy steels according to Cr content recently developed by Engineering Inspection Department of Standard Oil Co. (S10, SS)

82-S. Cobalt 60 in the Foundry. John C. Pennock. *American Foundryman*, v. 21, Jan. 1952, p. 60-61.

Use for detection of internal defects in castings. (S13)

83-S. Determination of Sulfate in Chromium Baths Using Radiobarium. Stanley L. Eisler. *Metal Finishing*, v. 50, Jan. 1952, p. 71-74.

Procedure employing radiobarium in the precipitating agent used for determining sulfate concentration. The concentration was found to be inversely proportional to the counting rate of the filtrate containing the excess radiobarium. Test results compared with those of the conventional gravimetric procedure indicated better results could be ob-

tained by using the radiometric method. (S11, L17)

84-S. Locomotive Parts Inspection With Magnetism, Fluorescence and Black Light. Roy O. Schiebel, Jr. *Diesel Power and Diesel Transportation,* v. 30, Jan. 1952, p. 52-54.
(S13)

85-S. Emission Spectroscopy. William F. Meggers. *Analytical Chemistry,* v. 24, Jan. 1952, p. 23-27.
Review of 1950 and 1951 literature. 139 ref. (S11)

86-S. Electroanalysis. Samuel E. Q. Ashley. *Analytical Chemistry,* v. 24, Jan. 1952, p. 91-95.
Reviews 1949-1951 literature. 162 ref. (S11)

87-S. Ultraviolet Spectrophotometric Determination of Columbium. George Telep and D. F. Boltz. *Analytical Chemistry,* v. 24, Jan. 1952, p. 163-165.
(S11, Cb)

88-S. Spectrophotometric Determination of Rhodium With Hypochlorite. Gilbert H. Ayres and Frederick Young. *Analytical Chemistry,* v. 24, Jan. 1952, p. 165-168.
Pd, Pt, Au, Fe, Cr, and Ni ions can be tolerated in relatively large amounts, and Ru, Os, Ir, Co, Mn, and Cu in moderate quantities relative to Rh. Salts of Ir and Co catalyze the decomposition of the hypochlorite. Of the common anions, only iodide and iodate interfere. 11 ref. (S11, Rh)

89-S. Determination of Nitrogen and Sulfur in Steel. H. F. Beeghly, John J. Furey, W. R. Sayre, John L. Hague, Charles S. Mills, A. C. Parsons, and E. T. Saxer. *Analytical Chemistry,* v. 24, Jan. 1952, p. 199-205.
Report of round-table discussion held at 119th Meeting, ACS, Cleveland, Ohio, Apr. 1951. (S11, ST)

90-S. Fluorescent Tracer Agents. J. A. Radley. *International Chemical Engineering & Process Industries,* v. 33, Jan. 1952, p. 30-31.
Various uses of this technique. Application to detect tiny cracks and pinholes in certain sheet materials and to determine whether a batch of material has been properly mixed. (S13)

91-S. Application of the Trioxalatocobaltate (III) Color System to the Spectrophotometric Determination of Macro Quantities of Cobalt. J. P. Mehlig and G. J. Zeagas. *Chemist Analyst,* v. 40, Dec. 1951, p. 76-80.
Experimental procedure and results. The method is easily and rapidly carried out, and results compare favorably with those obtained by the iodide titrimetric method. 17 ref. (S11, Co)

92-S. Application of Statistical Methods. G. F. Komlosy. *Journal of the Birmingham Metallurgical Society,* v. 31, Dec. 1951, p. 178-192.
Some practical examples of these methods in a steel works such as distribution of weights of steel blocks and an investigation into certain drop-forging qualities.
(S12, F22, ST)

93-S. International Flame-Radiation Trials in Holland. *Engineering,* v. 172, Dec. 7, 1951, p. 705-706.
Summarizes work being done by an international group. See item 49-S, 1952. (S16)

94-S. Some Uses of Radio-Isotopes in Industry. J. L. Putman. *Metal Industry,* v. 79, Dec. 21, 1951, p. 115-157; Dec. 28, 1951, p. 543-545.
Radioisotopes and their properties. Several metallurgical applications are radiography of thick metal samples, measuring thickness of plating, measuring quantity of an element present, detecting level of molten metal, and measuring the mass of metal in a furnace. Concluding article: Detection of contamination, tracing stages in a complicated chemical process, autoradiographic techniques, and radioactivation analysis. 17 ref. (S19)

95-S. Radiographic Techniques for Examining Steel Castings. *Foundry Trade Journal,* v. 91, Dec. 27, 1951, p. 731-733.
Investigation carried out by members of the nondestructive testing subcommittee of BISRA into the relative merits of a number of radiographic techniques suitable for use on steel castings. Data are tabulated. (S13, CI)

96-S. Physical and Metallurgical Viewpoints in Ultrasonic Testing of Materials. (In German.) H. J. Seeman. *Metall,* v. 5, Dec. 1951, p. 531-537.
The problem of scattering and absorption in solid bodies and its connection with the structure of the test pieces. Data are tabulated and charted. 25 ref. (S13, M27)

97-S. Experiences With Nondestructive Testing of Materials. (In German.) K. Matthaes. *Metall,* v. 5, Dec. 1951, p. 544-546.
Various types of nondestructive tests and their technical advantages. (S general)

98-S. Study of a Method for Measuring the Thickness of Non-Magnetic Layers on Steel. (In Japanese.) Osamu Ito. *Journal of Mechanical Laboratory,* v. 5, Aug. 1951, p. 153-156.
The method consists of measuring the force required to separate a magnet energized by a.c. from the surface of a coated steel article, by use of a self-compensating magnetic balance. Thickness of nonmagnetic coatings and platings on a steel base can be easily measured without destruction. Graphs and tables. (S14, ST)

99-S. A Critical Investigation of the Use of the Silver Reductor in the Micro-Volumetric Determination of Iron, Especially in Silicate Rocks. Christina C. Miller and Robert A. Chalmers. *Analyst,* v. 77, Jan. 1952, p. 2-7; disc. p. 7.
13 references. (S11)

100-S. Controlled Potential Electrolysis in the Analysis of Copper-Base Alloys. G. W. C. Milner, and R. N. Whittem. *Analyst,* v. 77, Jan. 1952, p. 11-19.
A simple electronic instrument for automatically controlling the potential of the cathode with respect to a standard reference electrode in electro-gravimetric determination of metals. With this instrument, the majority of the usual alloying constituents of Cu-base alloys were successfully determined. 19 ref. (S11)

101-S. The Application of Quality Control in Steel Operations: Ford Motor Company. H. W. Clark. *Blast Furnace and Steel Plant,* v. 40, Jan. 1952, p. 64-70.
Refers to steelmaking and auxiliary operations. Graphs and illustrations. (To be continued).
(S12, D general, ST)

102-S. Automatic Furnace Controls. Leo Walter. *Canadian Metals,* v. 15, Jan. 1952, p. 20.
Fundamentals of high-temperature controls. Different systems for automatic control. (S16)

103-S. Low-Cost Atomic Furnace; Important Research Tool. *Iron Age,* v. 169, Jan. 24, 1952, p. 75-77.
Uranium is used as "fuel" in furnace designed by North American Aviation. Predicts that industry and research organizations will be able to afford low-cost, low-power atomic furnaces similar to this one. Production of "tagged atoms" will spur research. Design prevents reactor from destroying itself. Neutron production can be controlled by operator. (S19)

104-S. Magne-Gage Tests Plated Surfaces Quickly. *Iron Age,* v. 169, Feb. 7, 1952, p. 149.
The Magne-gage measures the thickness of both single and composite electrodeposited coatings, providing an indication of their value in preventing corrosion. The device uses the attraction between a small permanent magnet and a plated sample. (S14, L17)

105-S. Apparatus for Vacuum X-Ray Fluorescence Analysis of Light Elements. L. S. Birks. *Review of Scientific Instruments,* v. 22, Dec. 1951, p. 891-894.
Operation, results, and application of the apparatus, applicable to elements from Mg to Ti. (S11)

106-S. Temperature Regulations in Induction Heating. Homer E. Henschen, James W. Edwards, and Herrick L. Johnston. *Review of Scientific Instruments,* v. 22, Dec. 1951, p. 987-988.
Improved apparatus for temperature regulator in induction heating eliminates the optical lever by use of vacuum-tube amplifiers, thus improving sensitivity and eliminating the large time-constant of the galvanometer used in the earlier circuit. (S16, J2)

107-S. Spot Testing Aluminum Alloys. F. J. Bowen. *Steel,* v. 130, Jan. 28, 1952, p. 67, 74.
Simplified separation of different alloys in the field by use of a compact test kit. Flow chart. (S10, Al)

108-S. Measurement of the Thickness of Metal Plate by Ultrasonic Harmonic Method. I. On the Condition of the Thickness Resonance. (In English.) Sakae Tanaka. *Science Reports of the Research Institutes, Tohoku University,* ser. A, v. 2, Dec. 1950, p. 917-924.
A theoretical demonstration relating to the resonance of the mechanical vibrating system, which is composed of a quartz plate coupled to a metal plate through an oil film. (S14)

109-S. Geiger-Müller Counting Tubes and Their Technical Application. (In French.) R. Berthold and A. Trost. *Métaux: Corrosion—Industries,* v. 26, Nov. 1951, p. 442-455.
Structure and operation of the tubes and their many uses in the metallurgical field. Includes diagrams, charts, and photographs. 18 ref. (S19)

110-S. Use of Radon and Radioactive Isotopes in the Non-Destructive Testing of Materials. (In French.) F. Gottfeld. *Métaux: Corrosion—Industries,* v. 26, Nov. 1951, p. 456-459.
Describes procedures. (S19)

111-S. Autoradiochromatography. (In German.) H. Weil and Trevor I. Williams. *Angewandte Chemie,* v. 63, Oct. 7, 1951, p. 457-460.
Paper chromatograms which contain radio-active isotopes are rendered visible by their action on photographic films. Technique of experimentation and some successful applications. Numerous references.
(S19, S11)

112-S. Plant Analysis of Low Iron Contents in Zinc and Aluminum. (In German.) E. Eberius. *Angewandte Chemie,* v. 63, Nov. 7, 1951, p. 513-519.
Photometric method was perfected to be applicable to routine analyses. Includes diagrams, graphs, and tables. 18 ref. (S11, Zn, Al)

113-S. Photometric Analysis of Slight Arsenic Contents in Lead and Its Alloys. (In German.) Heinz Pohl. *Fresenius Zeitschrift für analytische Chemie,* v. 134, no. 3, 1951, p. 177-182.
The method makes it possible to determine 0.0001-0.2% As with an accuracy of ± 0.005%. Data are tabulated and charted. (S11, Pb)

114-S. Standards for the Australian Metals Industry. W. I. Stewart. *Australasian Engineer,* Dec. 7, 1951, p. 81-86.
Background of Australian standards and illustrates some of the problems which arise in the course of this work. The term "standard" is used to indicate a specification or code of practice prepared by a national standards organization. (S22)

115-S. Progress on Many Fronts in

ASTM Research and Standardization Work. R. E. Hess and R. J. Painter. *ASTM Bulletin,* Jan. 1952, p. 5-14.

Developments of past year in miscellaneous standards and specifications for metallic and nonmetallic materials. (S22)

116-S. Material Specifications and Standardization. Adrian A. Hofman. *Australasian Engineer,* Dec. 7, 1951, p. 105, 109, 111-113, 115, 117, 119, 121, 123, 125.

The nature of a specification, its uses, and limitations. Suggestions to those responsible for the drawing up of specifications, and the preparation and use of standard specifications. Desirability of rationalizing specifications. (S22)

117-S. Instruments to Fit The Job. Warren Walker, Jr., *Industry and Power,* v. 62, Feb. 1952, p. 71-74.

The most common temperature-measurement instruments, their applications, advantages, and principal differences. (S16)

118-S. Metallurgical Microspectroscopy Using Microdrills. Ford R. Bryan. *Journal of the Optical Society of America,* v. 41, Dec. 1951, p. 1061.

An improved microspectrographic method of identifying metallic constituents in metallurgical specimens. The principle consists of drilling out the minute portion to be analyzed, flowing a material such as collodion over the resulting chips, and transferring the collodion together with chips to a pure carbon electrode for spectrographic analysis. (S11)

119-S. Temperature Control Equipment. *Metal Industry,* v. 80, Jan. 25, 1952, p. 73.

Surveys some recent developments. (S16)

120-S. Ultrasonic Equipment Testing in the Petroleum Industry. Dwight J. Evans. *Oil and Gas Journal,* v. 50, Feb. 4, 1952, p. 70-72, 82, 84.

Ultrasonic instruments used both for detection of hidden flaws and measurement of metal thickness, as exemplified by the "Reflectoscope" and the "Audigage". (S13)

121-S. Field Inspection of Boiler Tubes With Ultrasonic Reflectoscope. J. A. Tash. *Transactions of the American Society of Mechanical Engineers,* v. 74, Feb. 1952, p. 201-205; disc., p. 206.

The ultrasonic reflectoscope and its use in detecting defective small-diameter tubing. (S13)

122-S. The Measuring Accuracy of Filament Pyrometers. (In German.) J. Euler and W. Schneider. *Zeitschrift für angewandte Physik,* v. 3, Dec. 1951, p. 459-467.

Experimental and theoretical studies show that a well-built filament pyrometer can measure temperatures with a high degree of accuracy. Diagrams, graphs, and tables. 12 ref. (S16)

123-S. The Thermocouple as a Radiation Meter; Critical Discussion and Survey of the Present Status of Development. (In German.) L. Geiling. *Zeitschrift für angewandte Physik,* v. 3, Dec. 1951, p. 467-477.

Study of various types of thermocouples. Seebeck effect, Lorenz number, determination of temperature and resistance noises as sources of interference, computation of inertia of thermocouples, and comparative results. Diagrams and tables. 28 ref. (S16)

124-S. (Book) **The Measurement and Control of Temperatures in Industry.** R. Royds. 252 pages. 1951. Constable & Co. Ltd., 10 Orange St., London W.C. 2, England. 25s.

Four chapters are devoted to the techniques applicable to each range of temperature. The construction, calibration, and use of expansion thermometers. Various commercial temperature controllers, using pressure or expansion elements or electrically sensitive temperature elements for on-off and proportional control systems. (S16)

125-S. (Book) **Modern Pyrometry.** Charles H. Campbell. 155 pages. Chemical Publishing Co., 212 5th Ave., New York 10, N. Y. $4.00.

The principles of pyrometry and new developments, as well as a selected group of pyrometric systems which give a good over-all picture of the techniques used and equipment available for temperature measurement and control. (S16)

126-S. (Book) **The Non-Destructive Testing of Metals.** R. F. Hanstock. 163 pages, Institute of Metals, 4 Grosvenor Gardens, London, S.W.1, England. $3.50.

Approaches the subject without limiting reference to any one type of testing such as radiography, magnetic, or ultrasonic methods. Other less known methods are also described with the object of presenting alternative approaches to difficult problems. (S general)

127-S. (Book) **Methodos de Analisis quimicos unificados.** (Standard Methods of Chemical Analysis. (In Spanish.) 2 vols. 163 and 49 pages. July 1950 and July 1951. Instituto del Hierro y del Acero, 15 Villanueva, Madrid, Spain.

Standards established by the Commission for Unification of Methods of Analysis, based on reports from government and private laboratories. Part 1 covers determination of C, S, P, Mn, Si, Cr, Ni, Mo, W, V, Cu, Co, Al, and Sn in steels, ingots, and castings. Part 2 covers determination of Ti, Zr, Cb, and B, and their relationship to various elements in ferrous metals and alloys in general use in the iron and steel industry. (S11, Fe, ST)

128-S. (Pamphlet) **Tabla de Tipificacion de Perfiles especiales para Construcciones soldadas. I Suplemento a la Tabla de Tipificacion de Perfiles Laminados, Abril 1950.** (Table of Characteristics of Special Shapes for Welded Construction. Supplement I to the Table of Characteristics of Rolled Sections, April 1950) (In Spanish.) 2 pages, 1951. Instituto del Hierro y del Acero, 15 Villa nueva, Madrid, Spain.

Tables and diagrams.
(S22, K general)

129-S. (Pamphlet) **Tablas technologicas de los Aceros finos de Construccion tipificados. Tabla Tecnologica del Acero al Cr-Ni-Mo de 120 Kgs. No. 282 I.H.A. Tabla tecnologica del Acero al Cr-Mo soldable, No. 831 I.H.A.** (Tabular Technical Data on Typical High-Grade Structural Steels; Tabular Technical Data on a 120-Kg. Cr-Ni-Mo steel, No. 282 I.H.A.; Tabular Technical Data on a Weldable Cr-Mo Steel No. 831 I.H.A.) 23 pages each. Sept. 1951. Instituto del Hierro y del Acero, 15 Villanueva, Madrid, Spain.

Mechanical, physical, and fabrication properties are tabulated and charted. Microstructures are illustrated. (S22, Q general, CN)

T
APPLICATIONS OF METALS IN EQUIPMENT

63-T. Successful Foil-Kraft Drum. *Modern Packaging,* v. 25, Jan. 1952, p. 105-107.

Containers for oil and grease. The top and bottom are of sheet steel; the sides are formed of multiple plies of Al foil laminated to Kraft linerboard. (T29, Al, ST)

64-T. Offset Aluminum "Decals". Ray Bloomberg. *Modern Lithography,* v. 20. Jan. 1952, p. 51, 53.

Decals are made of aluminum stock 0.003-in. thick, on which are imprinted type or designs, with a cellophane-covered cement backing for easy application. The process consists of creating a color-retentive coating on the surface of the foil by chemical means, then applying the printing by a standard Multilith offset process, in any color.
(T26, Al)

65-T. New Ordnance Materials. Benjamin S. Mesick. *Ordnance,* v. 36, Jan.-Feb. 1952, p. 573-576.

The lighter, stronger metals and plastics which will increase our airborne firepower. New welding electrodes for armor plate, ductile cast iron, Al, Mg, Ti, rubber, plastics, and adhesives. Unsolved problems. (T2)

66-T. Special Steels in Navy Blue. *Steel Horizons,* v. 14, Winter 1951-1952, p. 22-23.

Picture story of applications of stainless and other corrosion and heat resistant steels in the U. S. Navy. (T22, SS, SG-g, h)

67-T. Lead Shot for Gamma-Ray Shielding. *Nucleonics,* v. 10, Jan. 1952, p. 27. (From report of A. Nightingale, *British Journal of Radiology,* v. 24, 1951, p. 568.)

Cavity walls made of sheet iron and filled with 0.1-in. lead shot may be used to replace solid lead walls used to protect personnel against gamma radiation. The lead-shot walls are not suitable for shielding photographic materials. (T8, Pb)

68-T. Use of Materials; Problems of Application in Advanced Aircraft. H. H. Gardner. *Aircraft Production,* v. 14, Jan. 1952, p. 16-18.

Some materials and the characteristics that warrant their application to specific structural problems. Includes Al-Zn-Mg alloys, carbon steels, ferritic steels, and Ti.
(T24, Al, CN, AY, Ti)

69-T. Sleeve Bearings—Design, Manufacture and Installation. Richard J. Schager. *SAE Quarterly Transactions,* v. 6, Jan. 1952, p. 165-174.

Materials, design features, installation, and manufacture of sleeve bearings. Includes micrographs, macrographs, diagrams, and graphs. Emphasis is on pertinent mechanical properties and corrosion resistance of the various bearing metals and alloys.
(T7, Q general, R general, SG-c)

70-T. Trends in Industrial Piping. Will H. Shearon, Jr. *Chemical and Engineering News,* v. 30, Jan. 28, 1952, p. 316-321.

As applied to the chemical industry. Metals, plastics, glass, ceramics, and their combinations—including coatings and linings. Data on mechanical and physical properties, sizes available, etc., are tabulated. (T29)

71-T. Testing of Various Materials for Connecting-Rod Bearings, With Particular Emphasis on Conditions in the Ford-V8 Motor. (In German.) K. Longard. *Metall,* v. 5, Nov. 1951, p. 480-485; Dec. 1951, p. 539-544.

Investigations were made to develop a testing method for bearing materials in aircraft motors which would duplicate actual working conditions. Of the great number of contributing factors, three were chosen for closer scrutiny: the bearings, the lubricant, and the shaft system. Mechanical and physical test results for various ferrous and nonferrous alloys. 17 ref.
(T7, Q general, SG-c)

72-T. Studies on the Shape and Material of Coal Cutter Bits. II. (In Japanese.) Han. Watanabe. *Journal of Mechanical Laboratory,* v. 5, July 1951, p. 85-88.

Use of carbon steel, Stellite, white cast iron, and toolsteel bits. Tables and graphs.
(T28, CN, CI, TS, SG-m)

73-T. Metal Honeycomb Replaces Ribs, Stringers. *Aviation Week,* v. 56, Jan. 28, 1952, p. 41, 44.

In Northrop high-speed airplanes aluminum (3S-H) honeycomb core material is being substituted for the conventional rib and stringer make-up of control surfaces. It combines high strength-weight and stiffness-weight characteristics. (T24, Al)

74-T. Lead in Modern Chemical Construction. Kempton H. Roll. *Chemical Engineering,* v. 59, Jan. 1952, p. 281-282, 284-286, 288-290.

Latest techniques and improvements. Methods of supporting sheet lead, new methods of testing lead linings and welds, lead bonded to steel, lead-covered Cu or steel heating coils, and use of acidproof brick with an impervious lead interliner. (T29, Pb)

75-T. Hardened Gray Iron—an Ideal Material for Diesel Engine Cylinder Sleeves and Liners. Garnet P. Phillips. *Foundry,* v. 80, Jan. 1952, p. 88-95, 222, 224, 226, 228; Feb. 1952, p. 106-111.

Studies to determine the most desirable type of wear resistant iron for use in cast cylinder sleeves and liners of diesel engines. Results of wear tests on various iron alloys and special steels. Includes physical properties, corrosion tests, and microstructures. Second part: Molding and melting practices. Illustrations, graphs, and tables. (T25, Q9, R11, E11, CI)

76-T. Production Use of Tungsten Carbide Reamers. *Machine and Tool Blue Book,* v. 48, Feb. 1952, p. 187, 190, 192, 194.

Use of W carbides in increasing life of reamers for both steel and nonferrous materials. (T6, G17, W, C-n)

77-T. Aluminum Alloy Die Castings Used in Complex Automotive Parts. T. C. Du Mond. *Materials & Methods,* v. 35, Jan. 1952, p. 80-81.

Advantages in using Al. (T21, Al)

78-T. Steel for Machinery; Yesterday, Today and Tomorrow. Muir L. Frey. *Metal Progress,* v. 61, Jan. 1952, p. 55-58.

Past progress and trends in constructional steels, hardenability, high-temperature alloys, design, and research. (T26, T general, ST)

79-T. Light Metal Castings for Aircraft Structures. Keith F. Finlay. *Metal Progress,* v. 61, Jan. 1952, p. 81-83.

Future trends. Criticisms of existing practices. Emphasis is on Al and Mg, with brief mention of Ti. (T24, Al, Mg, Ti)

80-T. Production and Properties of Discs for Aircraft Gas-Turbine Engines. H. W. Kirkby. *Metal Treatment and Drop Forging,* v. 19, Jan. 1952, p. 3-11.

The types of steel and other high-temperature alloys now available for gas turbine discs. Mechanical properties and scaling resistance. Data are graphed and tabulated. 11 ref. (T25, Q general, SS, AY, SG-h)

81-T. Drilling With Coromant Equipment. J. Fred Johnson. *Mining Engineering,* v. 4, Jan. 1952, p. 37-41.

Coromant is the trade name of an alloy steel drill rod tipped with a chisel-type WC bit. Evaluates this equipment, giving detailed information on history of development, advantages and disadvantages, comparative performance of steel and WC bits, and footage drilled per bit in various types of rock. (T28, AY, C-n)

82-T. The Selection and Use of Drill Steel. Charles M. Cooley. *Mining Engineering,* v. 4, Jan. 1952, p. 43-46.

Types of drill steel available, life of drill rod and its determination, stresses in drill rod that cause typical failures encountered, and heat treatments and surface treatments for improving service life. (T28, Ts)

83-T. The Selection of Rock Drill Bits. Lamar Weaver. *Mining Engineering,* v. 4, Jan. 1952, p. 46-48.

Results of preliminary bit tests comparing detachable steel and tungsten-carbide bits. (T28, ST, C-n)

84-T. Aluminum in General Line Containers. *Modern Metals,* v. 7, Jan. 1952, p. 24-28, 30.

Miscellaneous packaging containers developed in England and Europe. Typical examples of shallow drawn, deep drawn, impact extruded, and built-up containers; lids and covers of all types; methods of manufacture; finishing and decoration. (T10, G general, L general, Al)

85-T. Why Magnesium in Aircraft Construction? R. Smallman-Tew. *Modern Metals,* v. 7, Jan. 1952, p. 33-35.

Pros and cons of Mg in aircraft. Some replacement examples in Roe's Jetliner, the first jet-powered commercial plane. (T24, Mg)

86-T. B-36 Experience With Magnesium. D. A. Tooley. *Modern Metals,* v. 7, Jan. 1952, p. 49-50, 52-54.

Strategic Air Command's B-36 intercontinental bomber contains more Mg than any other production-model airplane. What the magnesium industry should do to stimulate use of their metal by aircraft companies. Fatigue properties, corrosion preventive coatings, new alloys, and standard sizes available in various shapes. (T24, Mg)

87-T. Electrical Sheet Steel. P. Butler. *Proceedings of the Institution of Electrical Engineers,* v. 99, Pt. 1, Jan. 1952, p. 30-31. (A condensation.)

Differences in hot rolled and cold rolled core materials. (T1, F23, ST)

88-T. Aluminum: Heavy Expansion in a Light Metal. Vance Bell. *Steel,* v. 130, Feb. 4, 1952, p. 69-71.

Surveys possible new markets for Al for the day when there is no military outlet. (T general, A4, Al)

89-T. High Lead Copper-Lead Bearings Developed for Slow Speed Diesels. Albert Willi Jr. *Steel,* v. 130, Feb. 4, 1952, p. 94, 96, 114.

Application of Cu-Pb bearings to unhardened crankshafts. Improved casting technique, fatigue and corrosion resistance. (T7, Cu, Pb, ST, SG-c)

90-T. A Laboratory for the Production of Zirconium Ignition Pastes for Photographic Flashlamps. William C. Fink. *Sylvania Technologist,* v. 5, Jan. 1952, p. 7-9.

The properties and applications of Zr and the hazards involved in handling Zr powder. Design of a laboratory for work involving this material. 18 ref. (T1, P general, H11, Zr)

91-T. Simplified Approach to Toroidal Inductor Design. Part 2. H. E. Harris. *Tele-Tech,* v. 11, Feb. 1952, p. 52-53, 70, 73-74, 78, 80, 82.

Design procedures to provide a rapid determination of the applicability of a new core material. The use of Mo permalloy for cores. (T1, SG-n)

92-T. The Selection of Aluminium Alloys for Shipbuilding. (In English.) D. W. Taylor and W. Muckle. *Schweizer Archiv für angewandte Wissenschaft und Technik,* v. 17, Dec. 1951, p. 365-379.

Part 1: Choice of the preferred alloys in relation to economic production in the rolling mill of the required sizes of plate and sections and to influence of chemical composition on rolling and mechanical properties. Examples of manipulation of material in the shipyard, and methods of joining. Weathering characteristics of the alloys. Part II: The different parts of a ship in which Al alloys can be used. Choice of material in relation to strength requirements and some examples of the weight saving which can be achieved. The influence of weight saving on design. (T22, Al)

93-T. Use of Light-Alloy Bolts for Mechanical Joining of Aluminum Conductors. (In French.) Auguste Dalmasso. *Revue de l'Aluminium,* v. 28, Nov. 1951, p. 393-395.

These bolts make it possible to keep the contact pressure constant whatever may be the variations of temperature. This avoids risk of creep in case of overheating, or of defective contact in case of a fall in temperature, both risks existing with steel bolts. (T1, K13, Al)

94-T. Gas Turbines. (In French.) Maurice Victor. *Revue de l'Aluminium,* v. 28, Nov. 1951, p. 409-426.

Textual and pictorial summary of gas turbines made for various countries. Emphasis is on applications of light alloys. (T25, Al, Mg)

95-T. Aluminum Alloys for Corrosion-Resistant Storage Tanks. E. C. Hartmann and Fred L. Plummer. *Civil Engineering,* v. 22, Feb. 1952, p. 25-27.

Tabular data show Al alloys most frequently used in storage tanks, mechanical properties, and recommended minimum shell-plate thicknesses. (T26, R general, Q general, Al)

96-T. How Dominion Coal Is Boosting Haulage Efficiency With Aluminum Cars and Diesels. *Coal Age,* v. 57, Feb. 1952, p. 94-97.

Advantages derived from the use of Al mine equipment by Dominion Coal Co. Ltd., Sydney, N. S. (T28, Al)

97-T. Printing From Magnesium Cylinders. C. H. Vivian. *Compressed Air Magazine,* v. 57, Feb. 1952, p. 42-46.

An engraved Mg printing cylinder trade-named Magnasleeve. (T29, Mg)

98-T. The "How To" of Aluminum in Distribution. C. E. Topping. *Electrical World,* v. 137, Feb. 11, 1952, p. 97-100.

Use of Al in power-distribution systems. (T1, Al)

99-T. Aluminum Era Hastened By Defense Needs. C. W. Leihy. *Electric Light and Power,* v. 30, Feb. 1952, p. 88-91.

Availability of Cu and Al, and Al prospects for electrical and mechanical applications in view of the "forced conversion" program of government control. (T1, A4, Al, Cu)

100-T. The Swing Toward Aluminum. Howard P. Seelye. *Electric Light and Power,* v. 30, Feb. 1952, p. 92, 136.

Shortage of Cu and possibilities in Al substitution in electrical construction. (T1, A4, Al, Cu)

101-T. AG&E Specifies Aluminum for Urban Overhead. H. A. Enos, R. J. Bentzel, and C. H. Wagner, Jr. *Electric Light and Power,* v. 30, Feb. 1952, p. 93-100.

Economic considerations led American Gas & Electric Service Corp. to use Al long before Cu shortages started. Some of their practices developed through increasing use since 1949. (T1, Al, Cu)

102-T. Detroit Edison's Aluminum Substitution Program. E. C. De Baene. *Electric Light and Power,* v. 30, Feb. 1952, p. 101-105.

Applications for Al and comparative physical and mechanical properties of Al and Cu. (T1, P general, Q general, Al)

103-T. Aluminum for Underground Network Cables. C. P. Xenis. *Electric Light and Power,* v. 30, Feb. 1952, p. 106-109.

Difficulties and methods of solving problems encountered in splicing Al underground cables. Step-by-step method of constructing soldered joints. Brazed and riveted connections. Tensile test data. (T1, K7, K8, K13, Al, Cu)

104-T. ACSR in Overhead Distribution. R. W. Westphal and C. E. Topping. *Electric Light and Power,* v. 30, Feb. 1952, p. 110-117.

Construction details and problems involved in using steel-reinforced Al

conductors to replace Cu for power-distribution systems. Sketches show construction standards, pole and house connections, and clamps designed for bimetallic connections. (T1, Al, Cu, ST)

105-T. Aluminum Needs Good Connections. Julian Rogoff and Irving Matthysse. *Electric Light and Power,* v. 30, Feb. 1952, p. 118-122.

A test program was conducted in an effort to overcome the following characteristics of Al antagonistic to good electrical joints: oxide coatings, poor electrical conductivity, electrolytic corrosion, and softness which causes excessive creep. (T1, P15, R1, Q3, Al, Cu)

106-T. Aluminum Conductor—What the Suppliers Say About It. Cornelius F. Kelley. *Electric Light and Power,* v. 30, Feb. 1952, p. 124, 129-130.

Suppliers of conductors were asked where they could substitute Al for Cu. Comments and discussions are given. (T1, Al, Cu)

107-T. Aluminum Substation Structures Offer Attractive Possibilities. *Electric Light and Power,* v. 30, Feb. 1952, p. 131.

Advantages of Al over steel for this application. Reduced maintenance, greater safety, and saving in erection time and costs. (T26, Al)

108-T. The Application of Mechanically Held Carbide Tools. *Magazine of Tooling and Production,* v. 17, Feb. 1952, p. 70-73.

The Mechaniclampt carbide tool fabricated from a heat-treated alloy steel body and standard rectangular inserts, by Firth-Sterling Steel & Carbide Corp., Pittsburgh. Design of the holder is such that maximum strength and durability are incorporated. Tabulated data give comparative information on brazed, Mechanigript, and Mechaniclampt tools. (T6, G17, AY, C-n)

109-T. Trends in Carbide Tooling. Bennett Burgoon, Jr. *Magazine of Tooling and Production,* v. 17, Feb. 1952, p. 74, 114, 118.

Significant developments in the application of the carbide tool, and the tool itself. (T6, C-n)

110-T. Using Tungsten Carbide for Wear Resistance. *Magazine of Tooling and Production,* v. 17, Feb. 1952, p. 82, 108.

Uses for wear-proofing of welding and other fabrication equipment. (T5, Q9, SG-m, W, C-n)

111-T. Boron Treated Types of Alternate Steels. *Materials & Methods,* v. 35, Feb. 1952, p. 127, 129.

Tables indicating some of the applications in which boron steels have substituted successfully for more common standard steels. (T general, AY)

112-T. A Successful Experiment With Broaches. W. Jubb. *Metallurgia,* v. 45, Jan. 1952, p. 11.

A carbon case hardened steel and a Ni-Cr case hardened steel were used to make a set of broaches. Performance of these materials. (T6, G17, CN, AY, TS)

V

MATERIALS
General Coverage of Specific Materials

36-V. Boron Engineering Steels. Charles M. Parker. *Machine Design,* v. 24, Jan. 1952, p. 161-162, 206, 208.

Previously abstracted from *Steel.* See item 153-V, 1951. (AY, B)

37-V. The Refractory Metals. L. F. Yntema. *Record of Chemical Progress,* v. 12, Fall 1951, p. 177-183.

Problems of processing Cb, Ta, Mo, and W and some of their uses in metallic form. Processes include reduction and refining, powder metallurgy, and ceramic coatings for these metals; also their electrodeposition on nonrefractory metals. (Cb, Ta, Mo, W, EG-d)

38-V. A Century of Magnesium: 1852-1952. C. J. P. Ball. *Research,* v. 5, Jan. 1952, p. 5-9.

History of Mg and how its development has been associated with wartime demands for the metal. Summary of unsolved problems. (Mg)

39-V. Cupro-Nickel Castings. James S. Vanick. *Foundry,* v. 80, Feb. 1952, p. 100-105, 246, 248, 250-253.

Effects of various additions, effects of heat treatments, and mechanical and physical properties. Practices in welding, brazing, and soldering. Uses of Cu-Ni alloys. Graphs, tables and illustrations. (Cu, Ni)

40-V. Vanadium-Base Alloys. William Wilson, Jr. *Journal of Metals,* v. 4, Feb. 1952, p. 144.

Research in progress. Includes exploration of physical properties, effects of alloying elements and of heat treatments. (V)

41-V. The Outlook for 1952. *Light Metals,* v. 15, Jan. 1952, p. 6-32.

After a forword by E. G. West, the following articles are given: "Bauxite from Jamaica," Harold Champion; "Exploitation of Bauxite in Hungary," (anon.); "Canada's Expanding Aluminium Production," (anon.); "New Aluminium Smelter for Norway," (anon.); "More Plant to Meet Raising Aluminium Demand in U. S. A.," (anon); "Magnesium in Canada," H. G. Warrington; "The Industry in the World To-Day," (anon.); "Planning Ahead," (anon.); "Magnesium in Britain," R. G. Wilkinson; "Enterprise in Association," (anon.); "Production of Aluminium in Great Britain," (anon.); "Anticipated Demands for Aluminium Basic Products," (anon.); "Increasing Capacity for Electrolytic Finishing," (anon.); and "Aluminium Will Lead," (anon.) (Al, Mg)

42-V. A Review: Current Magnesium Alloy Compositions. J. C. McDonald. *Modern Metals,* v. 7, Jan. 1952, p. 40-41.

Recent progress in the improvement of Mg alloys, both wrought and cast. New alloying ingredients such as Zr with its grain-refining effect, and rare earths with their ability to endow Mg with high-temperature characteristics comparable with those of the best Al alloys. (Mg)

43-V. Titanium Production Up. *Steel,* v. 130, Feb. 4, 1952, p. 117, 120, 123-124, 126, 129.

Improvements in the manufacturing process, varied uses in view of its properties, and increased output. (Ti)

44-V. "Recidal." Characteristics of a New High-Resistance, Free-Cutting Light Alloy. (In Italian.) *Alluminio,* v. 20, Nov. 1951, p. 471-488.

Advantages and disadvantages. Alloy contains 4.0% Cu, 1.5% Fe, 0.6% Mg, 0.7% Si, 0.2% Ti, 1.0% Pb-Cd, and the remainder Al. Photographs, micrographs, tables, and charts. 111 ref. (Al, SG-k)

45-V. Recent Information on High Speed Steels. (In Spanish.) Haufe. *Instituto del Hierro y del Acero,* v. 4, Jan.-Mar. 1951, p. 86-90. (Translated from *Polytechnisch Tijdschrift,* Mar. 21, 1950, p. 198-203.)

Compositions and capabilities of German types in 1949; economic aspects of various compositions; influence of tempering; low-temperature and other treatments. Data are tabulated and charted. (TS)

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EMPLOYMENT SERVICE BUREAU

The Employment Service Bureau is operated as a service to members of the American Society for Metals and no charge is made for advertising insertions. The "Positions Wanted" column, however, is restricted to members in good standing of the A.S.M. Ads are limited to 50 words and only one insertion of any one ad. Address answers care of A.S.M., 7301 Euclid Ave., Cleveland 3, O., unless otherwise stated.

POSITIONS OPEN

REPRESENTATIVES: For Pittsburgh and Indiana, Minnesota, Kentucky, Missouri, Alabama, California, Oklahoma areas, by manufacturer of portable metal hardener testers. Metallurgical and machine tool background desirable. Should now represent one or two allied lines selling to metal fabricators and producers. Send background resume for interview to: Newage International Inc., 235 E. 42nd St., New York 17, N. Y.

East

METALLURGIST: Experienced in metalworking industry, aircraft preferred, for general metallographic analyses, process control, trouble shooting, and materials engineering, for cargo aircraft manufacturer. Send resume with salary requirements to: Employment Manager, Chase Aircraft Co., Inc., West Trenton, N. J.

PROCESS ENGINEER: For work on mechanical aspects of processing in nonferrous strip, rod and tube mills. Mechanical engineering degree preferred, with some knowledge of metallurgy. Experience in steel, aluminum or brass mill work desired, salary to depend on extent of such experience. Location, Connecticut. Box 3-5.

PHYSICAL METALLURGIST or PHYSICIST: Electronics research laboratory on East Coast needs graduate physical metallurgist or physicist in materials research section. Applicant should have a good background in theoretical physics of the solid state and be familiar with the use of such modern laboratory equipment as the X-ray spectrometer, grating spectograph, high-vacuum, etc. Box 3-10.

METALLURGICAL or MECHANICAL ENGINEER: Large eastern metal producing company has excellent opening for technical service and development work in hot and cold fabrication of nonferrous alloys. Knowledge of design desirable. State age, education and experience. Box 3-15.

METALLURGIST: Must be college graduate. Some experience in powder metallurgy and metallography preferred. Local metropolitan New Jersey. Salary open. Box 3-40.

INDUSTRIAL ENGINEER: Experienced in metals industry, for stainless steel manufacturer, to start industrial engineering department. Prefer man under 30 with some intensive experience in practical industrial engineering. Excellent opportunity for advancement in fast growing company. Give complete resume of education and work along with snapshot. Box 3-160.

SALES AND DEVELOPMENT ENGINEER: Recent graduate metallurgist or equivalent, under 30, for sales and development engineering work, by expanding stainless steel manufacturer. Send detailed resume stating initial salary requirement. Box 3-165.

Midwest

CHIEF ENGINEER: For stainless steel tube operation in new and expanding small company with excellent prospects. Write in full to: President, Damascus Tube Co., Greenville, Pa.

RESEARCH METALLURGIST: For exploratory research. Prefer June 1952 graduate. Write to: Director, Borg-Warner Central Research Laboratory, 706 South 25th Ave., Bellwood, Ill.

RESEARCH METALLURGIST: Excellent opening for metallurgist with interest in and knowledge of modern research methods in field of nonferrous physical metallurgy. Assignments will include titanium and high-temperature alloys. Prefer man with advanced college training but not essential. Should be able to initiate and execute overall research program. Excellent opportunities for advancement in growing organization. Write: Metals Department, Armour Research Foundation, Chicago 16, Ill.

METALLURGIST: Young metallurgist for quality control work. Experience in heat treating desired. Must be qualified to select new equipment and organize laboratory for complete testing. Ferrous field exclusively. Box 3-20.

SALES DEVELOPMENT ENGINEER: Challenging opportunity for a capable man with background and experience in sales or sales development. Capable of taking charge of the sales development, technical sales service and sales contacts in new segments of overall sales field of new metal industry. Headquarters in western Pennsylvania. Box 3-25.

METALLURGIST: Recent graduate, age 21 to 30, to be engaged in investigation of pressing problems and maintenance of quality in midwestern plant producing copper and brass mill products. Excellent opportunity to obtain knowledge of and experience in nonferrous metal processing. Please include resume of education, age, draft status. Box 3-30.

PHYSICAL METALLURGIST: Experienced Ph.D. or equivalent, interested in wide variety of petroleum metallurgical problems. Leading Midwest research organization. Box 3-35.

RESEARCH METALLURGIST: For industrial furnace manufacturer. Box 3-45.

RESEARCH METALLURGIST, JR.: For industrial furnace manufacturer. Box 3-50.

RESEARCH ASSISTANT: Assistantships open to qualified candidates for the M.S. and Ph.D. degrees at a state university. Research in fundamental physical metallurgy on government sponsored projects. Box 3-55.

ASSISTANT WELDING RESEARCH ENGINEER: Recent graduate, metallurgical or electrical engineer with welding training. Research and development in welding processes, design and application of mild steel, low-alloy steel, aluminum and stainless steel. Transition temperature studies. Applicant must be resourceful. Good opportunities for advancement. Box 3-60.

CERAMIC ENGINEER or POWDER METALLURGIST: For development in ceramals, refractories, dielectrics, powder metallurgy and crystal growth. Prefer man with about three to six years experience in one or more of these fields, with diversified interests for expanding work in all. Give details of background, experience and salary requirements. Box 3-65.

ENGINEER: For engineering department of a growing and progressive company near Toledo, Ohio. Four or more years experience required, preferably in chemical or metallurgical fields. Applicant should have ability to supervise and train technical personnel, develop new processes, design and oversee new installations. Box 3-70.

SUPERVISOR: Position open for qualified person to supervise the physical, metallographic and X-ray unit of laboratory doing aircraft work. Experience in these fields necessary. Age 25 to 45. Give complete information, including education and experience. Box 3-75.

GRADUATE METALLURGIST: Young man, with degree, needed for work in material control and new material development and application. Work in design of ferrous and nonferrous parts and control of heat treatment and laboratory of progressive hydraulic equipment manufacturer. Box 3-80.

WELDING ENGINEER: Capable of planning, conducting and reporting research projects in the field of welding. Engineering graduate preferred, with three to five years experience in welding research or manufacturing. Send resume and photograph to Employment Department, International Harvester Co., Manufacturing Research, 5225 S. Western Blvd., Chicago 9, Ill.

West

DEVELOPMENT METALLURGIST or MECHANICAL ENGINEER: For process development work on special materials involving rolling, extrusion, deep drawing, spinning, etc. Some experience in development of metal fabrication methods and knoweldge of die design preferable. Write: Personnel Department, Los Alamos Scientific Laboratory, University of California, P.O. Box 1663, Los Alamos, N. M.

BRAZING FOREMAN: Los Angeles area. If you have experience with copper or silver brazing, write: Box 4816, Los Angeles 1, Calif.

SALES METALLURGIST: Well-established progressive metals distributor in Southern California needs a young man to assist established sales force. Technical metallurgical assistance will be used to augment sales of copper, brass, aluminum, carbon, alloy and stainless steel. Physical metallurgy background with some plant experience desirable. Salary commensurate with experience. Box 3-85.

POSITIONS WANTED

FOUNDRY METALLURGIST: University of Illinois graduate, in early thirties, presently employed as metallurgist in melting department of automotive foundry making 1200 tons of castings from two cupolas, desires position where progress will depend on efforts expanded and results achieved. Experience includes all types of acceptance testing, control of foundry supplies, and heat treatments for both automotive and aircraft castings. Box 3-90.

METALLURGIST: Degree, age 26, married, one child. One and a half years experience in nonferrous production. Desires permanent position in Rocky Mountains or West. Experienced as plant metallurgist, control, minor supervisory. Likes challenging work. Thoroughly responsible. Box 3-95.

POWDER METALLURGIST: Degree, age 30, married, two children. Six years experience in specialized field of powder metallurgy, four and a half years as process engineer on development and production problems, five months as foreman over powder metallurgy inspection, and over one year as foreman on powder metal production. Desires position in development or production. Box 3-100.

METALLURGICAL ENGINEER: Degree, married, three children. Desires to locate in New Mexico, Arizona, Mexico or Latin America. Wide range of experience in instrumentation, mechanisms, product design, production push-

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ing, coherent research, ore dressing. Some Spanish. Long on ingenuity in tough situations. Box 3-105.

METALLURGIST: Graduate, age 34, married. Ten years of diversified industrial experience. Will consider other fields where background is useful. Only interested in greater Detroit area. Box 3-110.

METALLURGIST: M.S. degree, age 37. Eleven years diversified experience, four as metallurgist and quality superintendent in stamping plant, seven in factory trouble shooting on fabrication and use of most commercial alloys. Considerable fundamental research and report writing experience. Presently employed, but desires position with expanding company where future is possible. Box 3-115.

METALLURGIST: Executive caliber. Eleven years experience in research, development, manufacturing, material application, and ferrous and nonferrous material. Veteran, married, draft exempt. Supervisory experience, technical and nontechnical personnel. Desires key metallurgical position in manufacturing-development or sales-development with a reputable, progressive East Coast firm. Box 3-120.

SALES ENGINEER: Independent, covering Indiana, Illinois, Michigan and Wisconsin, desires additional line on commission basis. College graduate experience in development, metallurgical and sales engineering. Only high quality products or materials will be considered. Box 3-125.

METALLURGIST: B.S. in chemical engineering. Married, age 37, three children. Fourteen years plant metallurgist on development and shop problems, the last six supervisory. Capable of planning and directing laboratory or foundry. Well versed in metal fabrication, heat treatment, corrosion and metal finishing. Consultant on materials and processes. Box 3-130.

METALLURGIST: B.S. degree, age 31. Experienced in forging and commercial heat treating. Interested in future in sales, process engineering. Supervised operation of atmosphere furnaces bright annealing, brazing and bright hardening stainless steels, nonferrous and ferrous alloys. Six years with a leading manufacturer of forged jet blades as metallurgist. Extensive customer contact. Box 3-135.

METALLURGICAL ENGINEER: Nonferrous. B.S. degree with advanced training in metallurgy. Chief metallurgist for five years with large manufacturing company, 12 years in research activities. Experience in directing research and development, including engineering, patents, markets and costs. Desires responsible research or management position in aggressive ferrous or nonferrous metal producing or manufacturing company. Box 3-140.

RESEARCH LABORATORY SUPERVISOR: With broad administrative and technical background desires more responsible position in either research or production. Five years production experience with a steel manufacturer, three years with Naval Ordnance plant as metallurgist in charge, seven years supervisory research experience. Publications and patents. Age 38, married. Box 3-145.

PHYSICAL METALLURGIST: Age 32, M.S. degree. Ten years diversified experience in teaching and industrial metallurgy. Broad understanding of engineering materials, processes, and principles. Specialization in nonferrous foundry metallurgy, supervisory experience. Desires responsible position in development or quality control requiring high caliber individual. Will relocate. Box 3-150.

METALLURGIST or METALLOGRAPHER: Age 33, married. Graduate Temple University night course in physical metallurgy. Three years experience in laboratory work on ferrous metals and titanium. Some experience on other nonferrous metals. Desires position in Philadelphia area but willing to go anywhere. Box 3-155.

METALLURGICAL ENGINEER: B.S. degree from Carnegie Tech. Age 30, married, one child. Nine years diversified experience in research, development and engineering. Broad interests, mechanical and electrical aptitude. Evening school credit in business management. Desires responsible position as product engineer or technical assistant to administrative or engineering executive. Box 3-170.

METALLURGICAL ENGINEER: B.S. degree. Age 27, married, two children. One year graduate work. Experience in nonferrous development and production trouble-shooting, and also in refractory metals. Desires position with small progressive company, preferably South. Box 3-175.

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46-V. Properties of Hard Metals. (In Spanish.) Walter Tofaute and J. Hinnüber. *Instituto del Hierro y del Acero*, v. 3, Oct.-Dec. 1950, p. 261-269.

Composition and classification of sintered carbide and carbide-metal compositions, methods for avoiding cracks due to welding stresses; elasticity; resistance to heat, oxidation, and corrosion; and progress in methods of fabrication. Micrographs, tables, and photographs. (C-n, SG-j)

47-V. Gallium. (In Spanish.) Mauricio Béja. *Nucleo*, v. 6, Sept. 1951, p 1-8.

Properties and characteristics. Includes spectrograms and photographs. 56 ref. (Ga)

48-V. Copper and Copper Alloys; A Survey of Technical Progress during 1951. E. Voce. *Metallurgia*, v. 45, Jan. 1952, p. 16-22.

Raw-material resources, extraction, fabrication, finishing, and properties. 188 ref. (Cu)

49-V. Alloy Conservation: Boron Fills the Bill. Alexander H. d'Arcambal. *Steel*, v. 130, Feb. 18, 1952, p. 107-108.

Properties, advantages, limitations, and applications of boron steels. (AY)